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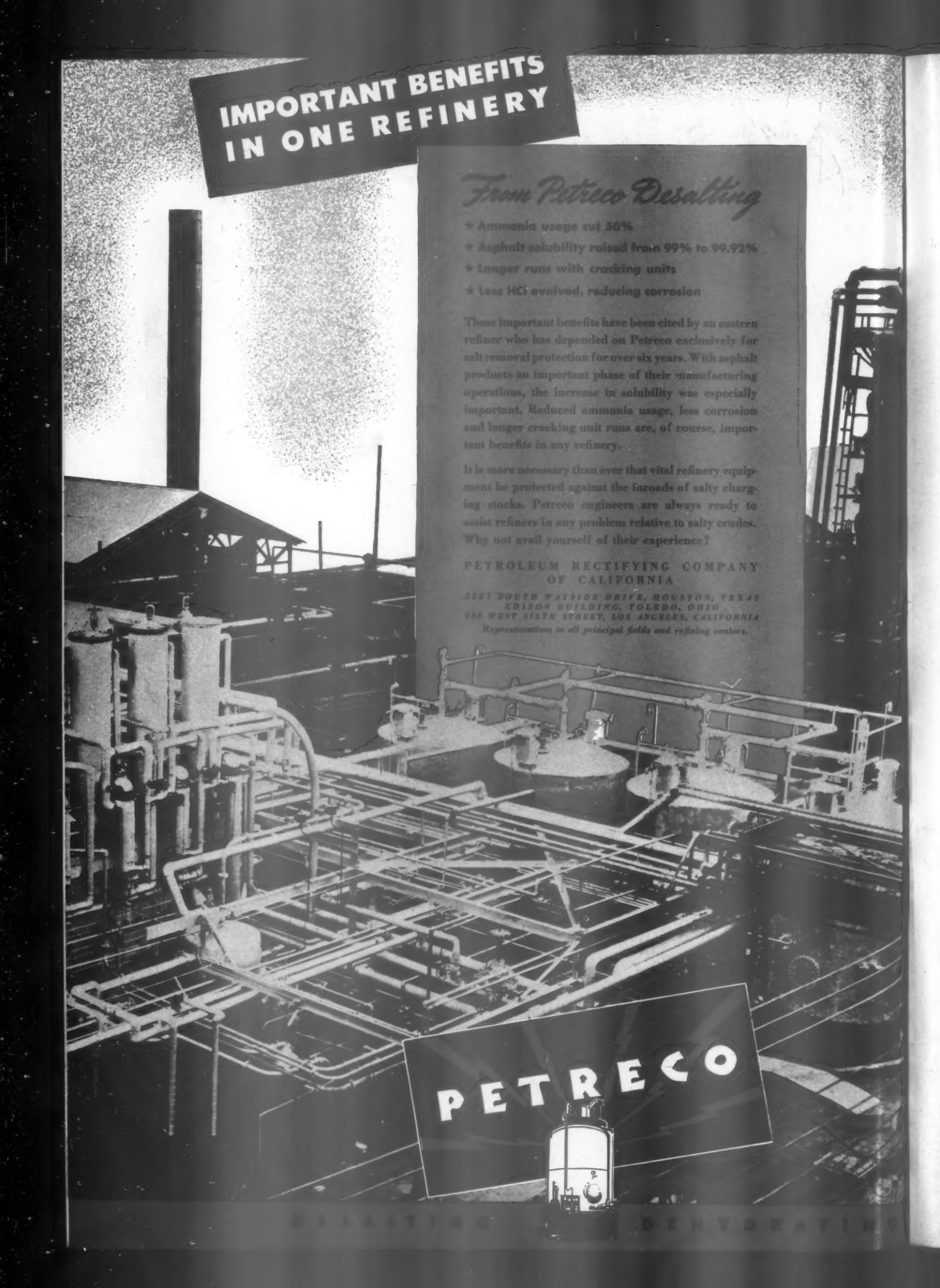
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211 S. CHEYENNE ST., TULSA, OKLAHOMA

Subscription price, United States and foreign, 1 year, $6.00; 2 years, $10.00; 3 years, $12.00; 5 years, $15.00. Single copies, 20 cents. Back copies, when over a year old, 50 cents. Entered as second-class mail matter at Tulsa, Okla., under Act. of March 3, 1879. Copyright 1943, by The Petroleum Publishing Co.

Vol. 41, No. 52 May 6, 1943

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Trends

Crude-Oil Production By States—Page 150

CRUDE PRODUCTION 3,896,295 bbl. daily average—down 25,625 bbl. One year ago 3,345,835 bbl.

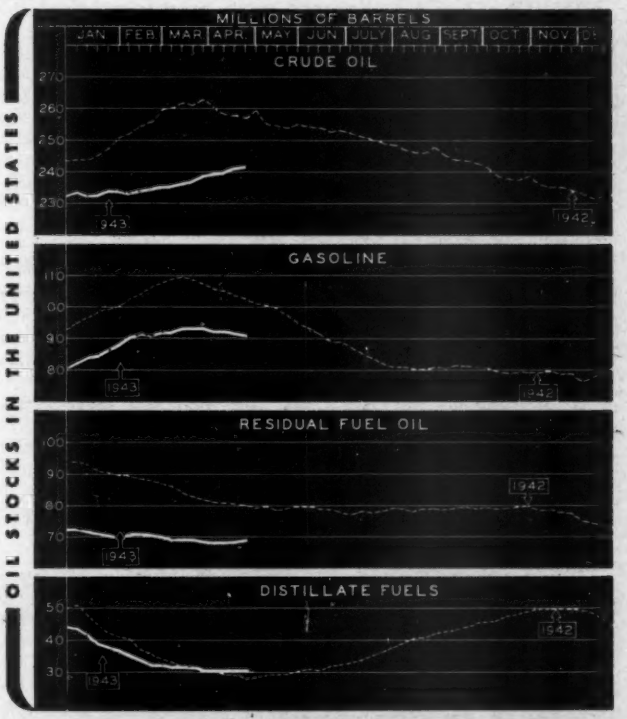
CRUDE STOCKS 242,035,000 bbl. as of April 24—up 614,000 bbl. One year ago 257,073,000 bbl.

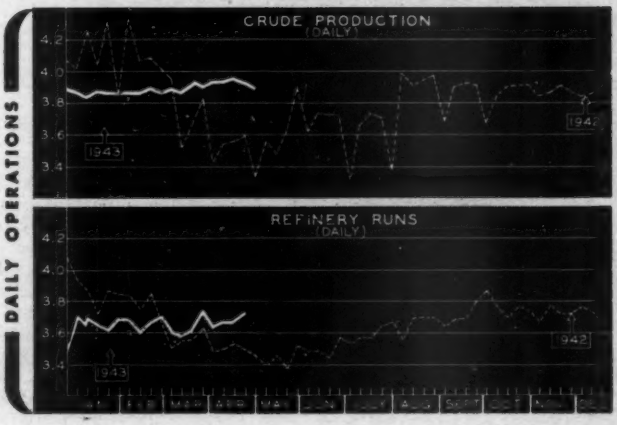
GASOLINE STOCKS 91,114,000 bbl. as of April 24—down 1,007,000 bbl. One year ago 103,359,000 bbl.

RESIDUAL FUEL-OIL STOCKS 67,455,000 bbl. as of April 24—up 448,000. One year ago 80,374,000 bbl.

GAS OIL AND DISTILLATES 31,142,000 bbl. as of April 24—up 216,000. One year ago 28,407,000 bbl.

REFINERY RUNS 3,737,000 bbl. daily week ended April 24—up 65,000. One year ago 3,500,000 bbl.





THE situation in the eastern and southeastern states carries over into the Middle West and the Southwest where refineries and other sources of supply are nearer the oil fields and where it had been hoped that civilians would at least have gasoline for their vacations. It is apparent from the weekly reports that no excess supplies of gasoline are accumulating in this interior and Gulf Coast area. In the Mid-Continent and in the Middle West stocks of gasoline at most refineries are much lower than they were a year ago with the peak harvest demand to start soon. It is agreed that substantial imports from adjoining refining centers to these agricultural areas will be necessary to carry them through the summer months. Those in close touch with conditions point out that the attitude of local rationing boards over a large part of the United States is more and more liberal in regard to the issuing of B and C cards with those holding the A cards accounting for most of the reductions in civilian use.

PROSPECTS for a liberalization of gasoline use by civilians over the next few months are not bright. Many had assumed that with the end of the fuel-oil consuming season more transportation could be made available for the movement of gasoline, and rationing regulations which became effective nationally December 1, 1942, and in the eastern, southeastern, and northwestern states several months earlier, would be liberalized. Washington officials have stated that no lifting of the severe restrictions in gasoline consumption in the East by civilians is in prospect in the near future because of the increased demands for oil products to be shipped from terminals to the war fronts in Europe and Africa.

THE need for obtaining the maximum quantities of high-octane gasoline for war use is also a direct factor in the shortage of civilian grades of motor fuels. Several refiners who had shifted their cracking operations to produce codimer and other blending cuts for the manufacture of aviation gasoline had expected that the main construction program for 100-octane gasoline would be far enough along by early summer that they could return to their normal plant operations. With war-department officials pointing to a substantial shortage in 100-octane gasoline for May and the summer months it is assumed that all refiners will be called upon to produce maximum quantities of blending stocks regardless of the sacrifices involved in the production of other products.

Rapid Expansion of Refinery Conversion Probable Answer to Aviation-Fuel Shortage

by Henry D. Ralph

WASHINGTON, D. C.—A reexamination of the 100-octane and synthetic-rubber plant construction projects which will increase aviation-gasoline output rapidly within a short time, probably by a widespread expansion of the refinery-conversion program, is expected to be undertaken by the administration as a result of hearings which ended this week before the Truman committee of the Senate.

Differences among officials over conflicts of the programs appear to be dissolving and the clash of personalities is giving way to a cooperative attempt to solve the problems. First step will be a field trip visit both to rubber and aviation-gasoline plants and component fabricators by Undersecretary of War Patterson, Undersecretary of Navy Forrestal, Rubber Director Jeffers, and representatives of the Petroleum Administration for War and the War Production Board. All parties have been in conferences recently and express confidence that ways can be found to increase aviation-gasoline capacity without serious interference with rubber and other war programs.

Prospect for big increases in refinery conversion to aviation gasoline is based on Undersecretary Patterson's testimony that while it takes 12 months to build a new refinery a big increase in production can be obtained in 6 months or less through conversions if materials are available, though he added that some new projects now on paper carry considerable hope for an early improvement in supply. The joint field trip will attempt to break construction bottlenecks in the hope of completing both aviation gasoline and rubber programs quickly, and Patterson said the result should be a redoubling of the efforts of the petroleum industry which has already shown remarkable ingenuity in improvising facilities without which "we would be in the soup for fair."

Mr. Patterson insisted flatly that there is a shortage of aviation gasoline, despite earlier denials by Donald M. Nelson and Harold L. Ickes. He quoted from a confidential PAW report of April 1 to show a shortage of 30,000 bbl. daily in April and 44,000 bbl. daily in May. He said production has been below requirements for months and PAW figures anticipated production below requirements every month of 1943.

Training planes in this country have been grounded for lack of 100-octane and fields that used to keep 30 days' supply are now all on a hand-to-mouth basis, so if Mr. Nelson thinks the trouble is maldistribution he is mistaken unless the Army is to ship less overseas. Mr. Patterson insisted overseas reserves should be larger than they are now. The fact that production has exceeded consumption does not take into consideration the 3-month lag in building overseas reserves, Mr. Patterson declared.

Plane Losses Below Estimates

The Undersecretary of War admitted some truth in charges that the Army has underestimated requirements but insisted on the whole it has done a good job in forecasting. He said that Administrator Ickes' statement that output now is more than the Army said it would want currently, overlooked the Army memorandum to WPB in February 1943 asking for aviation-gasoline capacity far above present levels, and insisted there is no question but that the Army has a severe shortage now, thought admitting this is partly due to much smaller loss of planes in combat than anticipated. He said requirements for today are more than three times what was being used 3 years ago, and requirements for the future are more than double those for today, and most of requirements must be filled by American refineries, including Canada and Aruba.

Mr. Patterson said the rubber program is necessary but it is not as urgent today as aviation gasoline. There are indications, he added, that rubber is in better condition and that there will be enough of it but not enough 100-octane. He declared that in endorsing air warfare the president gave aviation gasoline as much a directive as he gave rubber in endorsing the Baruch report, and that both programs should now be reexamined to see which needs help the most.

Mr. Patterson also referred guardedly to improvement in aviation-gasoline quality, saying the Army first went to "Grade 110," then to Grade 125, then to Grade 130, and now it wants to go to "Grade 140."

Jeffers Resists Interference

AS the final witness before the Truman committee, Rubber Director William M. Jeffers agreed that all programs can be advanced through cooperative action but insisted that the rubber projects cannot be cut back further without disaster, and that it should not be penalized because his office has done a good job in plant construction.

He defended his position so well that Senator Mead suggested that his engineers take over the aviation-gasoline program now that Petroleum Administrator Ickes is busy running the coal industry.

Mr. Jeffers insisted that the rubber program has not interfered with the current aviation gasoline or other programs but on the contrary has helped them because his engineers broke bottlenecks in equipment fabrication and the momentum of the rubber program had dragged forward all the others. He told the committee:

"In connection with the testimony of the Secretary of the Interior, I would like to point out three factors which he overlooked:

"1. The demands we made in following the Baruch report insistence that the rubber program be given higher priorities played a large part in the reorganization of the War Production Board and has brought about the present-day scheduling procedure directed by Mr. Wilson and Mr. Cordiner which is benefiting all programs.

"2. The Secretary of the Interior claims that he lost 4 million barrels of high-octane gasoline. Had he taken

into account the additional production that was brought about because of our activities and because of his share of the directives, he would have found that he gained, or at least suffered no loss.

"3. The byproducts made by the butadiene plants of the rubber program which were given the first directives will provide constituents for more than 20,000 bbl. per day of high-octane gasoline, and the plants being built without directives will make a still further valuable contribution to the high-octane program.

"The above points equally dispose of the comments of the Undersecretary of War as to the impact of the rubber program."

The rubber director said he expects to produce 275,000 tons of synthetic rubber this year which will reduce inventories to 145,000 tons on December 31, since 1943 consumption for all purposes is now estimated at 609,000 tons as compared with hi February estimate of 612,000 tons. Army and Navy have been able to reduce their rubber consumption considerably, he said. The country will need 12,000,000 tires this year.

The program called for making 5,000,000 synthetic tires in 1943, but actual production may not be more than 1,000,000. Next year 25 to 30 million synthetic tires must be made to keep cars running. Recent liberalization of rationing recaps was criticized by the committee as indicating ample supplies of rubber, but Mr. Jeffers said this was all reclaim of which there is 2 years' supply and does not affect the synthetic program but was done because local ration boards can distribute to essential users better than rigid OPA rules.

Army Underestimated Needs

WASHINGTON, D. C. — Aviation gasoline is now being produced in greater quantities than the Army said it would require at this time, even though the Army is now complaining of a shortage, but much greater quantities would be available now if the War Production Board had granted the requests for materials submitted by the Petroleum Administration for War.

This was asserted by Administrator Ickes at hearings last week before the Truman committee. The petroleum administrator appeared before Undersecretary Patterson and William M. Jeffers, rubber director, testified before the Truman group.

Mr. Ickes admitted that his requests to WPB for materials for 100-octane refineries had consistently been larger than the capacity which the Army and Navy said they would need, and that production of aviation gasoline has been considerably ahead of the Army requirement schedules since the beginning of the war. He severely criticized WPB for not allocating even more materials to his program. Earlier WPB Chairman Nelson had told the committee that the demands for critical common components of the various programs were so great that all of them had to be scaled down.

Only the preceding week, on April 19, Mr. Ickes said, the WPB finally authorized a construction schedule for 100-octane plants which is satisfactory, and this will permit the completion some time this fall of refineries now in various stages of construction. He added, however, that capacity should be increased even beyond this schedule, regardless of other demands for materials and of present military estimates of requirements for aviation fuel. He justified this position because of the fact that Army estimates of demand have consistently been below what the Army actually required.

The only way PAW has been able to obtain more 100-octane than the Army said it was going to need was through refinery conversions and other makeshift arrangements, the administrator said, and if it had depended on the Army's estimates of capacity requirements there would now be a very serious shortage. The administrator paid high tribute to the cooperation of the petroleum industry in this program, but was highly critical of all the government agencies with whom he has had to work. He said he advocated that the priority system be abandoned in favor of a scheduling system 1½ years before WPB finally adopted this method.

Very few figures on the 100-octane program were given by Mr. Ickes in open session, but he related this chronology:

During the spring of 1941 production was about 24,000 bbl. daily. That summer he asked the industry to double capacity, making it 80,000 bbl. daily, though the Office of Production Management at that time estimated that a capacity of only 50,000 bbl. daily would be required by the first of 1943. The industry was reluctant to accept his program because it costs $5,000,000 and takes a year or more to build a 100-octane refinery, but in the absence of Army and Navy long-time commitments the RFC agreed to finance construction and purchase output.

In November 1941 Mr. Ickes presented the Supply Priorities and Allocations Board a comprehensive program for new-plant construction and refinery conversions, and immediately after Pearl Harbor he launched the industry on a program of sharing patents, blending agents, facilities, equipment, and knowledge in order to increase production with a minimum of new construction. In October 1941 OPM agreed to a program for doubling 100-octane capacity. In December 1941 the program was raised to three times the then capacity, and was further increased in February, March, and May of 1942.

"Official figures of military requirements, meanwhile, had been almost impossible to obtain," Mr. Ickes told the committee. "It was not until May 1942 that we were able to obtain a semiofficial requirements figure, estimating that, by December 1943 the demand for 100-octane would be of the same general magnitude as the

William M. Jeffers, rubber director, is met on a recent inspection trip which he will soon repeat accompanied by Army, Navy, PAW and WPB representatives, by J. B. Fritchman, left, personnel manager of the B. F. Goodrich plant at Port Neches and Arthur Kelly, right, general manager of all Goodrich chemical plants

production which we had been setting out to make. Even that was based on a then obsolete plane program and we were obliged to make our own estimate as to the additional quantities which the additional planes would require. In September 1942 the situation was still such that no official long-range figures were available for 1944, and we made our own unofficial estimate based on information from the Aeronautical Board which indicated a requirement in 1944 almost double that estimated earlier in the year. Between February and April of this year the indicated requirements rose sharply again and the end is not yet in sight.

"The petroleum industry, under the guidance of PAW, will produce this month more fuel every day than the official requirements figures extant last July indicated would be necessary at this time. Further, I venture the opinion that in July of this year —obstacles or no obstacles—we will be producing more fuel every day than the best estimators had believed, a year ago, that we would need by now—or even by next winter. However, in accomplishing these objectives we did not have the help with construction materials which we had to have to carry out the program."

The petroleum administrator said that there are now 42 aviation-gasoline refineries in operation, in addition to about 50 conversions, but there would be some 50 new plants in operation if it had not been for conflict with other construction programs.

Answering questions by the committee, Mr. Ickes said that the WPB directive of April 19 will permit completion of the 100-octane program on a satisfactory schedule, but he insisted that the program should be still further enlarged because of the tendency of the Army to underestimate its requirements and in order to provide a surplus for any military developments.

WEP Will Move 80,000 Bbl. Daily Of West Texas Crude Oil in May

by Paul Reed

PREPARATIONS are being made by War Emergency Pipelines, Inc., to move West Texas crude oil through the Longview, Tex.-Norris City, Ill., 24-in. line at a rate of 80,000 bbl. daily in May. After the 316,000-bbl. shipment of No. 2 heating oil is sent from Norris City in tank cars to the East Coast in the middle of this month, no additional fuel oil will be moved through the big-inch until the entire 24-in. line has been completed to the East Coast.

More than meeting its original schedule of 5,577,000 bbl. in April, WEP shipped 6,292,402 bbl. of crude from Norris City in 24,669 cars last month, of which 5,390,652 bbl. went by tank car direct from Norris City and 901,750 bbl. went via Enfield, Ill., to loading racks on Ohio Pipe Line Co.'s system. The April record is remarkable when it is considered that the line faced a shortage of cars at the beginning of the month and a shortage of oil at the middle.

While this demonstrates that the line exceeded the quota set more than a month ago, it is still apparent that the line has not been permitted to operate at more than 65 per cent of capacity of pipe line and terminal facilities, definitely established in test periods.

For May, schedules for the WEP line are planned for movement at approximately the 210,000-bbl. average daily rate of the April shipments. The May schedules have been modified several times and are subject to change without notice. Recently oil has been moving out of Norris City at a daily rate of considerably more than 280,000 bbl. per day. It is possible that the new schedule may be stepped up to 300,000 bbl. daily. No additions to the tank-car pool were planned at the beginning of this week. In fact there is some tendency to withdraw cars from the pool.

Early Monday morning there were no empty tank cars at the Norris City terminal. Tank-car loadings at Norris City last week averaged 909 cars daily, the smallest being 810 and the largest 1,058. May 2 the number of cars loaded was 670.

Heating oil in storage at Norris City amounted to 260,700 bbl. of the 316,000 bbl., to be accumulated there for shipment by tank car eastward in the next 10 days.

As a result of larger allowables, deliveries of East Texas and South Texas light crude have improved.

The 80,000 bbl. daily shipments of West Texas crude will be delivered to WEP at Longview through hookups which have been recently arranged. Pan American Pipe Line Co. will receive West Texas crude from Texas-New Mexico Pipe Line Co. in the Houston area for transshipment to WEP. Sun-Yount Lee Pipe Line Co. will pump West Texas crude north from Nederland, Tex., which will be received from Gulf Refining Co. and Stanolind Oil Purchasing Co. Atlantic Pipe Line Co. was pumping about 40,000 bbl. of Gulf Coast oil north at the first of the week and arrangements are being made to have it move West Texas and New Mexico crude in the near future.

SCHEDULE OF MAY CRUDE-OIL DELIVERIES AND SALES TO WEP AT LONGVIEW, TEX.

	Bbl.
Atlantic Refining Co.	569,000
Central Pipe Line Co.	46,500
Cities Service Oil Co.	372,000
Gulf Refining Co.	772,000
Humble Oil & Refining Co.	1,116,000
Magnolia Petroleum Co.	434,000
Pure Oil Co.	217,000
Shell Oil Co., Inc.	372,000
Sinclair Prairie Oil Co.	465,000
Stanolind Oil Purchasing Co.	372,000
Sun Oil Co.	1,310,000
Tide Water Associated Oil Co.	542,500
Total	6,608,000

SCHEDULE OF MAY CRUDE-OIL SALES BY WEP AND DELIVERIES INTO TANK CARS

Company—	Loading point	Destination	Bbl.
Atlantic Refining Co.	Norris City, Ill.	Philadelphia, Pa.	806,000
Cities Service Oil Co.	Benton, Ill.	East Braintree, Mass.	310,000
Cities Service Oil Co.	Norris City, Ill.	East Braintree, Mass.	465,000
Gulf Oil Corp.	Norris City, Ill.	Philadelphia, Pa.	237,500
Gulf Oil Corp.	Martinsville, Ill.	Philadelphia, Pa.	274,000
Sinclair Refining Co.	Martinsville, Ill.	Marcus Hook, Pa.	155,000
Sinclair Refining Co.	Norris City, Ill.	Marcus Hook, Pa.	930,000
Standard Oil (N. J.)	Norris City, Ill.	Bayway, N. J.	1,508,500
Socony-Vacuum Oil	Norris City, Ill.	Blissville, N. Y.	310,000
Sun Oil Co.	Bridgeport, Ill.	Marcus Hook, Pa.	160,000
Sun Oil Co.	Norris City, Ill.	Marcus Hook, Pa.	677,000
Tide Water Asso. Oil	Norris City, Ill.	Bayonne, N. J.	775,000
Total			6,608,000

THIS WEEK

MATERIALS—WPB slashed list of specifications on tubular goods to 168 items, from 300. . . . Fifteen per cent increase in tubular goods to result, Washington estimates. . . . ¶Amended P-98-b still kicking around PAW office. . . . Preliminary reports indicate it will please operators, probably liberalizing many phases of procurement, to invite more exploration and development. . . . ¶Companies warned to prepare fourth quarter requirement schedules promptly for controlled materials, be ready to file official forms, which PAW will soon supply. . . . ¶Refiners advised to order all valves promptly, manufacturers' order boards may be frozen, in the near future. . . .

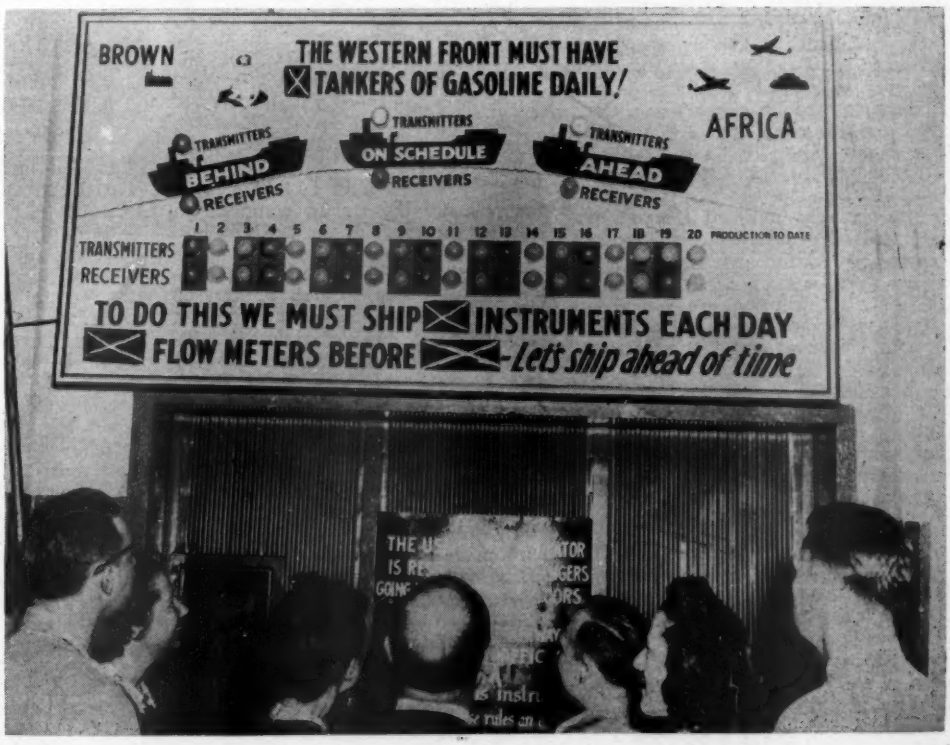
MARKETS—Price Administrator Brown categorically denies recommended crude-price advance. . . . Asserts rise would be contrary to anti-inflation order. . . . Proposes partial government financing of exploratory work, as alternate. . . . Says this, and other methods, will bring adequate stimulation to drilling. . . . Rejection of PAW and industry-wide recommendation does not change attitude in most circles, that higher prices are inevitable, if industry is to meet production obligations. . . .

REFINING—Huge expansion in refinery-conversion program anticipated, to overcome aviation-gasoline shortage, in quickest possible time. . . . Opens path for war production to scores of additional plants, solidifying their positions in the matter of crude supplies. . . . ¶Squabble over materials shaking down to benefit aviation-gasoline projects, apt to take precedence over rubber, possibly over other critical war requirements. . . . ¶Forty-two aviation units in operation, exclusive of about 50 conversion plants. . . . ¶Under Secretary of War Patterson guardedly refers to 140-octane gasoline as current fighting grade. . . . ¶Army, Navy, PAW, WPB, Rubber Administration representatives to make inspection trip, decide what will get first call, where materials will be diverted. . . .

SUPPLIES—Shortage of 44,000 bbl. daily in aviation-gasoline production this month, calculated by PAW, accepted by Army. . . . ¶East Coast index remains at lowest point, 28.1 per cent of normal. . . . Inordinately high military demand prevents customary stockpiling. . . .

TRANSPORTATION—Use of tank cars for shipping heating oil, from District 2 to East Coast, banned, except from Mississippi and Ohio River terminals. . . . Indicates growing need for tank cars in other services, probably separate from WEP. . . . ¶Rail movement to East Coast, including tank and box-car shipments, averaged 939,853 bbl. daily, last week, off 3,202. . . .

PRODUCTION—West Texas producers to supply 80,000 bbl. of crude daily average, to WEP stream, this month. . . . First major turn in war-depressed market for sour oil, also relieves pressure on other areas for more crude. . . . ¶WEP deliveries via tank cars, this month scheduled at 6,680,000 bbl. . . . Procurement and delivery schedules set up in detail. . . .



This novel scoreboard in an instrument manufacturer's plant gives employes an inning-by-inning account of progress in the production of flowmeters for 100-octane, synthetic-rubber and other vital war plants. Lights advance progressively as production tasks are completed. Production figures have been deleted for military reasons. Lights on pictures of tankers indicate whether output is behind, on or ahead of schedule

Fifty-Year History of Carter Oil Co. Closely Parallels Oil's Growth

Col. John J. Carter, founder of the company, and its president for the first 22 years of its corporate life, was born in Ireland. He first entered the oil industry at Bradford as an independent in 1877

HISTORY of the Carter Oil Co., Tulsa, which May 1 celebrated its fiftieth year as a producing concern, is virtually a saga of the oil industry. The Carter company, now one of the chief producing subsidiaries of the Standard Oil Co. (New Jersey), operates in 21 Middle West states, either directly or through subsidiaries. Carter's present gross operated production of more than 70,000 bbl. daily is a tribute to firmness of the company's foundation and to the aggressive operating policies pursued through its half century of existence.

Attesting to the aggressive policies which have characterized Carter Oil Co., from its inception, are the recent expansion of operations in the Rocky Mountain district and the company's operation in the Louden field, Fayette County, Illinois, one of the few fields in that state in which pressure maintenance was instituted shortly after its discovery. Louden is one of the outstanding exceptions to general operations in Illinois.

Founded at Sistersville

The company was organized May 1, 1893, at Sistersville, W. Va., by Col. John J. Carter, a resident of Titusville and one of the pioneer Pennsylvania oil operators. The founder was born in Westport, County Mayo, Ireland, in 1842; came to America at the age of 4 years; attended Nunda Literary Institute at Nunda, N. Y.; enlisted in the Union Army as a private at the outbreak of the Civil War in 1861, attaining the rank of lieutenant colonel before his discharge 4 years later. He was cited with the Congressional Medal of Honor for "most distinguished gallantry in action" in the Battle of Antietam.

Colonel Carter entered the mercantile business in Titusville in 1865 and became an oil operator in the Bradford field in 1877.

Sold to South Penn

Shortly after Colonel Carter organized his own company, controlling interest was acquired by the South Penn Oil Co., a subsidiary of what was later to be known as Standard Oil Co. (New Jersey). He continued as president of the Carter company until 1915, 2 years prior to his death.

Successful from its inception, the Carter company expanded westward to the Mid-Continent with growth of the industry in the early part of the twentieth century, establishing headquarters at Tulsa.

First production in Oklahoma was acquired by the Carter company in 1915 by purchase of the Yarhola and Manuel leases in the Cushing-Drumright field, and in the same year entered the El Dorado area in Kansas. From that date forward Carter has been an important participant in Mid-Continent petroleum operations, both as a producer and purchaser, interesting itself in such fields as Burbank, Seminole, Oklahoma City and Fitts in Oklahoma; Kraft and Trapp in Kansas; Billy Creek and Salt Creek in Wyoming; Louden and Dix in Illinois; Prairie Creek and Mount Vernon in Indiana and the new Robards pool in Kentucky. The full list of fields in which Carter has participated in operations is much more extensive, but those mentioned serve to illustrate the scope and character of its activity.

The Carter company launched an extended campaign to augment its production by discoveries and development upon first entering the Mid-Continent and has sustained this objective with increasing zeal with the passage of time.

The company was among the earliest advocates of conservation and has been a consistent exponent of progressive production practice. It is an established policy with the company to make extensive study of oil reservoirs wherever it operates and to pursue practices consistent with conservation and efficiency. In 1935, Carter aggressively interested itself in unitizing operations in the South Burbank field, Osage County, Oklahoma. Combined efforts of operators, including Carter, eventually evolved one of the first unitization programs of this type.

The company entered Arkansas and Louisiana as a producer in 1940 and later merged with Louark Producing Co., subsidiary of the Standard Oil Co. of Louisiana, to form one of the largest production organizations in those two states.

Carter's Current Expansion

At the end of 1942, Carter purchased controlling stock of the Santa Rita Oil & Gas Co., and Northwest Refining Co., in Montana. By this acquisition, for the first time in its 50 years of operation, Carter became interested in the manufacturing and consumer-market phases of the oil industry. Furthermore, the company acquired substantial production in Montana, a northwestern producing state in which Carter was not previously represented.

The company's current activities extend over 21 states with producing operations in Kansas, Oklahoma, Arkansas, Louisiana, Mississippi, Illinois, Indiana and Kentucky. Exploratory activity covers a much wider area, extending as far east as West Virginia.

The company's modern research laboratory at Tulsa, normally dedicated to the development of improved exploratory and producing methods, also is now devoted to war work, the nature of which is a military secret.

Announcing—

PETROLEO INTERNACIONAL

The Journal completes plans for publication of Spanish-English oil magazine

PLANS for the publication of Petroleo Internacional, a Spanish-English magazine for the petroleum industry of Latin America, have been completed and those connected with the new enterprise are at work preparing for the first issue which will appear at an early date. Petroleo Internacional will be published by Petroleum Publishing Co., Tulsa, owner and publisher of The Oil and Gas Journal.

Dr. Oscar B. Irizarry, who is well known in the petroleum industry as a market analyst, assumed his duties as editor of the new publication on April 15 after resigning his position as Dean of the College of Liberal Arts of the Polytechnic Institute of Puerto Rico in March to accept the new position. He will shortly start on a trip to most of the countries which will be included in the circulation of Petroleo Internacional. Much of his time will be spent abroad in close contact with the people for whom the magazine will be published.

Previous to his connection with the institute in Puerto Rico, Dr. Irizarry was located in Tulsa, where he became interested in oil operations of countries which are Spanish in language and tradition. He was active in the development of a standardized Spanish-English vocabulary for oil-field and refining equipment, having served on an official committee for the International Petroleum Exposition appointed for this purpose. He made trips to the oil fields south of the border in order to secure first-hand information on methods of operation, from which reports were compiled for American manufacturers covering drilling and pumping equipment. His work included analysis of oil-marketing possibilities in several countries.

Dr. Irizarry is a native of Puerto Rico. After completing his schooling in that country, he attended Park College, Parkville, Mo.; the University of Kansas, and the University of Chicago. He received the degrees of bachelor of arts and master of arts, and for his educational work in Puerto Rico during the administration of Admiral William D. Leahy, as governor, he was awarded the honorary degree of doctor of literature.

PUBLICATION FILLS NEED

DECISION of the publishers of The Oil and Gas Journal to establish a bilingual affiliate to appear every other month followed an extended investigation which clearly revealed the need for a publication of this type. The twenty-one countries of South America, Mexico, Central America and the Caribbean area which will be served by the new publication account for 15 per cent of the world's land area and more than 10 per cent of its population. With the exception of Brazil, which is Portuguese, the entire area is Spanish in language.

DR. OSCAR B. IRIZARRY

Petroleo Internacional will be devoted to the exploratory, drilling, producing, transportation, refining, natural-gasoline manufacture and distributing operations of the petroleum industry in the Spanish-speaking countries. Printed in both Spanish and English, the publication has been designed to give the nationals of those countries and their English-speaking peoples information on the latest practices extending from the oil fields to the operation of terminal and marketing facilities.

The crude-oil production of Latin America just previous to the entry of this country into the war had increased to approximately 1 million barrels daily, exceeding any other area outside the United States. This production was sufficient to furnish the oil supplies not only for the Latin-American countries with large exports to the United States and Canada but the surpluses also largely took care of the petroleum deficit of the Eastern Hemisphere. With large proven reserves in relation to current output this prewar production, which has been curtailed somewhat due to the restrictions in transportation, can be expanded rapidly in the postwar period.

Geologists agree that the probable and possible oil areas in Latin America, most of which have not been actively explored, exceed those of the remainder of the Western Hemisphere. An increasing quantity of oil produced in the Spanish-speaking countries will be refined locally in accordance with policies adopted by the oil companies and by the governments.

Petroleo Internacional recognizes the need for information printed in Spanish covering all divisions of oil operations. It fits into the program of governments and oil companies which are anxious to familiarize the nationals of those countries with petroleum's techniques. These nationals are playing a more and more important part in oil operations, including the highly technical and engineering phases. Petroleo Internacional, through its editorial and advertising pages, will give these operators and technicians the up-to-date information they require, wherever they are located.

Higher Production and Runs To Stills Needed to Build Up Depleted Eastern Oil Stocks

A SUBSTANTIAL increase in crude-oil demand and in runs to stills is in prospect when transportation facilities improve to the extent permitting replenishment of stocks on the East Coast. This outlook was expressed last week by the Bureau of Mines in its monthly petroleum forecast for May in which a daily demand for crude of 3,919,400 bbl. daily is predicted, an increase of 7 per cent above the actual requirements in the same month a year ago.

Another significant trend indicated by the bureau report is that the demand for gasoline is leveling off at somewhat higher rates of consumption than projected from results of the first quarter. Total demand for motor fuel in May is estimated at 49,400,000 bbl., 10 per cent less than the actual requirements in May 1942. Bureau figures for the first quarter indicate a total demand for motor fuel of about 124,000,000 bbl., a reduction of 17 per cent. On the same basis, the demand for distillate fuel oil decreased about 9 per cent and the demand for residual fuel oil was almost 3 per cent below 1942's first quarter.

Demand for gasoline is leveling off at approximately 10 per cent below 1942, rather than at a depressed rate of 17 per cent previously indicated by the first-quarter situation. A substantial increase in crude demand and refinery operations is indicated as soon as transportation facilities are sufficient to allow replenishment of depleted stocks on the East Coast. These are the pertinent points in the Bureau of Mines' forecast for May prepared under the supervision of A. G. White, chief of the Petroleum Economics Division.

While total demand is substantially below last year, the bureau reports, the demand for domestic crude petroleum showed a fractional gain. Stocks of all oils remained at an almost stationary level compared to a decline of about 10,000,000 bbl., in the first quarter of 1942. Crude runs showed a decline of about 3 per cent and imports were relatively low.

Daily average crude production and total runs to stills during the 4 weeks from March 6 to April 3, the bureau figures show, were 3,899,000 and 3,641,000 bbl., respectively. During this period, stocks of domestic crude oil increased an average of 149,000 bbl. daily, indicating a demand for domestic crude of 3,750,000 bbl. per day.

The bureau estimates a decrease of 600,000 bbl. in finished gasoline stocks during May this year, against liquidation of 6,666,000 bbl. of motor-fuel inventory a year ago.

Gasoline Figure May Be Low

Decisions to liberalize the mileage ration of occupational drivers outside the eastern petroleum-shortage area was announced subsequent to release of the bureau's report for May and it is not clear whether this factor, certain to increase gasoline demand, has been considered in calculating the consumption.

Direct sales of natural gasoline are estimated at 1,600,000 bbl., an increase of 162,000 bbl. over the actual year ago, making an indicated refinery production of 47,200,000 bbl. The gasoline production forecast is distributed among the various refining districts as follows: Censored area (includes East Coast, Inland Texas, Texas Gulf Coast, Louisiana Gulf Coast and Inland Louisiana-Arkansas), 20,630,000 bbl.; Appalachian, 2,010,000; Indiana, Illinois, Kentucky, etc., 10,840,000; Oklahoma, 2,210,000; Kansas, 2,721,000; Rocky Mountain, 1,490,000, and California, 7,300,000 bbl.

Natural gasoline to be blended at refineries is estimated at 4,650,000 bbl. Application of the motor-fuel yield, estimated at 37.0 per cent on crude charged, to the straightrun and cracked-gasoline production of 42,550,000 bbl., gives total crude runs of 115,000 bbl., or 3,709,700 bbl. daily.

SUMMARY OF FORECASTS FOR MAY 1943

(Figures in barrels)

	Forecast May 1943	Actual May 1942
Total motor-fuel demand	49,400,000	55,079,000
Supply of motor fuel:		
Gasoline production	42,550,000	42,703,000
Natural gasoline used at refineries	4,650,000	4,272,000
Total refinery production	47,200,000	46,975,000
Other natural gasoline and imports	1,600,000	1,438,000
Decrease in finished stocks	600,000	6,666,000
Available supply	49,400,000	55,079,000
Crude-oil requirements:		
Per cent yield of gasoline from crude	37.00	39.95
Refinery crude required	115,000,000	106,883,000
Daily average	3,709,700	3,447,000
Domestic crude runs	114,800,000	105,707,000
Exports, fuel and losses	6,700,000	7,605,000
Total demand for domestic crude	121,500,000	113,312,000
Daily average	3,919,000	3,655,200

Note: The term "motor fuel" as used in this report includes gasoline and naphtha used for all purposes, but does not include heavier distillates used in the operation of tractors or burned in diesel engines.

H. W. Dodge Named Director In Charge of District 1

WASHINGTON, D. C. — H. W. Dodge, vice president and general sales manager of the Texas Co., has been appointed director in charge of District 1 of the Petroleum Administration for War. He will maintain offices in New York City.

Mr. Dodge has been in government service almost continuously since December 29, 1941, as an executive in the War Production Board, dealing chiefly with materials. Eventually he rose to the third ranking position in the Materials Division working under William L. Batt.

Operators Warned to Make CMP Requirement Schedules Promptly

WASHINGTON, D. C.—Oil operators were warned last week that less than a month remains in which to file their requirements for controlled materials in the fourth quarter.

Simultaneously, the Petroleum Administration for War advised supply companies to examine the status of their orders already placed with engine manufacturers with the view of filing PD-1X applications on those rated below AA-2X.

"It is presently planned," F. A. Watts, director of materials for PAW, wrote district directors, "that all petroleum industry operators who will require controlled materials during the fourth quarter of 1943, and who drilled more than 40,000 ft. of hole during 1942 should file before June 1, applications by PAW districts, for controlled materials (casing, tubing, line pipe, standard pipe, drill pipe) for other than maintenance, repair and operating purposes. It is necessary that these petroleum industry operators immediately complete their drilling programs and promptly tabulate their fourth-quarter requirements for controlled materials. Operators who during 1942 drilled less than 40,000 ft. of hole and who are able to project their drilling operations into the fourth quarter of 1943 should also survey their requirements.

"Neither group of operators should at this time prepare and file their applications for controlled materials but they should project their requirements on a basis which will enable them to file their applications by or before June 1. It is anticipated that special forms for this purpose will be available in sufficient time to allow the operators ample time to translate their estimated requirements before June 1, on forms which will be later distributed by PAW.

"Those operators who drilled less than 40,000 ft. of hole during 1942, and who are unable to estimate their fourth-quarter 1943 requirements, will be able to delay preparing and filing their applications for controlled materials not later than 30 days before the date the materials will be required for their operations."

An examination of the order boards of engine manufacturers, the PAW materials division informed supply companies, indicates that many orders placed with the manufacturers by petroleum-equipment houses were not scheduled for delivery in 1943 due to low preference ratings extended by the supply firms to the engine manufacturers. For this reason, PAW's explanation continued, it seems quite likely that such low-rated orders will probably remain on the manufacturers' books indefinitely, or until the supplier is requested by the manufacturer to cancel the order.

PAW suggests that the various oil-field-equipment supply houses file PD-1X applications with the War Production Board, on which would be reported all engine orders which the supplier now has on file with the engine manufacturers where the rating is AA-2X or lower.

The Distributors Branch of the WPB has practically assured PAW that it will be in position to grant AA-1 ratings which will make it possible for the supply houses to notify the engine manufacturers to uprate their orders. Due to the length of time such orders have been on the manufacturers' books, this should schedule the engines for early delivery, PAW pointed out.

Federal Order Digest

PAW Regulations

Eastern Supplies—PD 59, Amendment 2: Provides a petroleum "kitty" from which government orders will be withdrawn, leaving suppliers regular allotments for usual business, effective May 3.

Tank-Car Shipments—Telegraphed Order: Prohibits use of tank cars for movement of heating oils from District 2 to District 1, except from Ohio and Mississippi River terminals for barge lines, effective May 3.

New WPB Rules

Tubular Goods—LO L-211, Schedule 9: Limits the production of oil-country tubular goods to a list of 168 items, reduced from more than 300 previously produced and specified by the industry, effective April 30.

Tubular Goods—LO L-211, Schedule 10: Provides standard specifications for water-well tubular products, including casing, drive pipe, reamed and drifted pipe, pump pipe and couplings, effective April 30.

OPA Rationing Rules

Fuel Oil—RO 11, Amendment 61: Terminates emergency arrangement which permitted householders to obtain up to 50 gal. of fuel oil in a minimum time and reminds consumers that "general hardship" provisions of rationing regulations permit local boards to issue supplemental allotments, effective May 1.

Fuel Oil—OPA announces plan for giving householders in the 33 fuel-oil rationed states and the District of Columbia their next season's ration coupons through the mails, probable mailing time—late May or early June.

Mileage—RO 5c, Amendment 45: Provides for lifting the ceiling on mileage which may be allowed for in-course-of-work driving outside the eastern shortage area from 470 miles a month to 720 miles, effective May 1.

OPA Price Regulations

Air-Conditioning Equipment—SR 14, Amendment 162: Establishes method of pricing equipment of less than 25 hp., sold as part of the WPB program to convert such facilities for use in war industries, effective May 1.

Services—MPR 165, Amendment 20: Authorizes OPA or its regional administrators to establish maximum prices for essential services in an area where there is an actual or threatened shortage, effective May 7.

Lend-Lease Operations

Petroleum—Report, covering March 1941 through March 31, 1943, shows lend-lease petroleum shipments valued at $413,312,000.

Gulf Oil Expands North Texas Holdings

Gulf Oil Corp. last week increased its recent investment in North Texas producing properties to $2,700,000 by the purchase of the Mangold-A lease on north half of Block 35, Mangold subdivision of the P. Castleman Survey A-35, in the K.M.A. field of North Texas. There are four 3,700-ft. producers and two 4,300-ft. producers on the lease, with a daily allowable of 241 bbl.

Gulf is reported to have paid $500,000 for the property.

Sunray and Superior Considering Merger

Negotiations are under way to effect a merger of Sunray Oil Corp. and Superior Oil Corp., both headquartering in Tulsa. C. H. Wright and Elmo Thompson, heads of the two concerns, have been conferring with bankers representing each firm, and while no details of the consolidation have been announced, it is understood that preliminary arrangements have been completed. Combined assets of the two concerns are said to be approximately $18,000,000.

As of December 31, 1942, Sunray had assets of $12,500,000, and a net profit for the year of $818,713. Superior's assets at the close of the year were $5,000,000, and it earned $184,652. Crude production last year of Sunray was 2,881,000 bbl., while that of Superior was 1,310,000.

Crude-Price Advance Rejected

WASHINGTON, D. C.—OPA has denied the PAW request for a 35-cent increase in crude-oil prices. Administrator Ickes Tuesday received a letter from Prentiss Brown of OPA saying that careful study by the OPA staff shows the increased price is not possible under law and executive orders and is not economically designed to increase oil production. Mr. Brown said that specific relief should be granted for stripper wells and repressure projects when production is now unprofitable; full development of proven fields should be insured through other action; increased incentives for exploration should be given through government financing.

Mr. Brown proposed that the Government furnish capital for wildcatting, taking one-quarter override interest in commercial producers, saying the Government could drill 4,500 wildcats for $15,000,000 whereas a 35-cent increase would cost $500,000,000.

Mr. Brown said that a higher price usually stimulates discoveries but a low price is not the cause of present low discoveries since wildcatting is now at a high level. Manpower, spacing restrictions, proration and transportation difficulties were given as more important restrictions than price, and Mr. Brown said more could be done by correcting these than by a price increase.

Mr. Brown said that a price increase would help producers but not wildcatters without funds. OPA proposed a subsidy plan under which the Government would sustain no out-of-pocket expense if the historical ratio of dry holes obtains, but if the dry-hole ratio is less favorable, government cost would be far less than expense to public of price increase. Under this plan the Government's one-quarter override interest in a dry hole would be worthless and the driller would have no obligation for funds advanced. If the well is a producer the operator would have the option of continuing override or liquidating government interest at $7 for each $1 advanced. The loan would be limited to two-thirds estimated cost of well.

Mr. Brown admitted that the problems of stripper wells and secondary recovery are serious, but said the abandonment rate is not high and would not be changed much by a price increase. Only 15 per cent of production is in this class, and Mr. Brown suggested that a plan be worked out to confine any price increase to such wells. While production costs have increased somewhat recently, Mr. Brown said that the average margin between net cost and price of crude the second quarter of 1942 was in excess of the corresponding amount in 1939 and 1940.

State Capitals

TEXAS

THE JUNE PRORATION order will be written on the basis of testimony of producers and purchasers submitted at the state-wide hearing in Austin May 19. This month's hearing will be the first held in Austin since the legislature convened in January.

AN INTERMEDIATE string of casing has been eliminated from the rules governing operations on the east side of the south end of the Seminole field, Gaines County, by amendment of the Railroad Commission's order. Where development has shown that the Yates gas is absent, or present in only a very small quantity, the requirement for an intermediate string of casing is waived, providing the surface pipe is set through the red beds.

KANSAS

ALLOWABLE production of 305,000 bbl. daily in May was provided for last week in the Corporation Commission's proration schedule. The authorized rate of production is 4,700 bbl. per day below the May quota certified by the Petroleum Administration for War and compares with purchaser nominations of 345,986 bbl. of crude daily. April allowable for the state was 309,900 bbl. daily.

The May allowable includes about 5,000 bbl. per day of natural gasoline and condensate, was dropped below the PAW quota, T. A. Morgan, conservation director, announced "in the interest of conservation." Several Kansas operators have declared in recent weeks that the rates of production in certain flush fields were higher than warranted by sound conservation practices, hastening encroachment of water and depletion of pressure.

MICHIGAN

PRODUCTION this month is expected to fall approximately 6,000 bbl. per day below the Petroleum Administration for War quota of 62,100 bbl.

F. R. Frye, state petroleum engineer, reported last week to the state Oil Advisory Board that production in May probably will average about 56,176 bbl. per day compared to a demand of 64,663 bbl. daily. The state has consistently fallen behind recent production quotas assigned by the PAW.

ARKANSAS

MEMBERSHIP in the Interstate Oil Compact for another 4 years was assured Arkansas last week when Gov. Homer M. Adkins became the second top state executive to ratify the extension agreement. The agreement extends membership in the compact until September 1, 1947. Oklahoma was the first state to ratify extension.

FORMAL reply has not been received yet by the Oil and Gas Commission to a request that development in the Dorcheat-Macedonia area be authorized on a basis of one well to 80 acres. However, it was understood at the commission's headquarters in El Dorado that its application had been rejected by the Petroleum Administration for War. Representatives of PAW attended a meeting last month at Magnolia at which considerable engineering data were placed in the commission's record. In its formal application for an exception to PAO 11 in behalf of the Dorcheat-Macedonia area, the commission asserted that for the expenditure of 213 tons of steel necessary in the completion of the average well on 80 acres, a yield of 1 million barrels of oil and condensate and 4 billion cubic feet of gas would be realized.

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

A Way to Save Manpower

MANY were startled when one of the industry's successful integrated companies explained to stockholders that last year it had spent a sum equivalent to 10 per cent of its net income in compiling statistical information and reports for the Government and for committees within the industry.

The first reaction was that the figure was much too high but most operators quickly came to the conclusion when they checked their own records that the total was representative or "below average" for active companies.

These checks on 1942 operations indicate that the petroleum industry at this time has the equivalent of 9,000 persons who devote their entire time to the preparation of reports requested by governmental and other war agencies and bureaus, involving outlays of approximately 50 million dollars yearly. This total does not include the expenditures of independent jobbers and dealers.

These figures, of course, are approximations for, as pointed out by the company that took the trouble to investigate this major operating item, "to attempt to arrive at any exact figure for this cost would be to indulge in the same passion for statistics that has created the trouble."

Any legitimate excuse that may have existed for this now impossible situation which springs from a confused and disorganized Washington, has long since ended. In the early days of the war, duplication of reports, the compilation of half-baked data which didn't mean anything to anyone, the long line of red tape in getting or in failing to get a piece of equipment and on down through the hundreds of other reports, might be condoned as a reflection of Washington's unpreparedness.

But in recent months the pattern of the oil industry's war operations has been definitely established. It shouldn't be necessary for executives, departmental heads and office help to spend long hours filling out questionnaires and other forms in order to do their part in drilling 1,200 wells monthly or to build a 10-mile gathering pipe line. The report end of new refinery construction should now be largely over and so far as routine plant activity is concerned operators, if given the opportunity, will demonstrate that they can do what it is necessary with a minimum of Washington direction.

Much could be accomplished in the simplification of government-industry relationships if all the Washington agencies would work through PAW. A week's check on the mail of a company engaged in all divisions of the industry's operations will show duplicate requests coming from OPA, WPB, the Army, the Navy and other bureaus and agencies.

If these requests were cleared through PAW most of them would never be sent out. In many instances the information required is already in Washington or could be obtained quickly from the industry through PIWC and other organizations. Certainly there is nothing new in legislative information that isn't already available from the thousands of pages of testimony.

Those representing the petroleum industry at Washington and elsewhere could do operators and the entire war effort no greater service than to bring these conditions forcibly to the attention of those responsible. All this has a direct bearing on manpower and the efficiency of every contribution to the war program that this industry will make until peace is declared.

Walter M. Miller Given Honorary Degree As Doctor of Engineering

AN honorary degree as doctor of engineering was conferred in Tulsa May 3 on Walter M. Miller, vice president in charge of manufacturing for Continental Oil Co., Ponca City, Okla., at the graduation ceremony of the University of Tulsa.

Doctor Miller was presented as a worthy candidate for the degree by P. C. Lauinger, Tulsa, a trustee of the university and president of Petroleum Publishing Co. The degree was conferred by Dr. C. I. Pontius, president of the university.

In presenting Mr. Miller "as worthy of receiving from the University of Tulsa the honorary degree of doctor of engineering," Mr. Lauinger said:

"Representing the board of trustees of the University of Tulsa, I present to you Walter Miller, refining engineer and executive in the oil industry.

"For nearly 35 years Mr. Miller has devoted his full energy and rare talents to the refining problems of the oil industry. His achievements in this field have been so many and so important that he is respected by all men in the petroleum field throughout our country and abroad.

"Mr. President, Mr. Miller is no ordinary engineer. He is a leader in his profession. He is a member of the American Society of Mechanical Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society for Testing Materials, the American Society of Chemical Engineers, the British Institute of Petroleum, and the American Petroleum Institute. He has, since 1932, prepared the annual report of progress in petroleum refining for the American Institute of Mining and Metallurgical Engineers. He is an inventor and coinventor, and holder of several patents. He is a scientific writer, and has contributed the chapter on refining in 'The Science of Petroleum' for the Oxford University Press.

"In addition, Mr. Miller has shown superior executive ability. His capacity for performance has been recognized by the members of his profession and his qualities of leadership have placed him in high positions. Since 1917 he has been charged with executive responsibilities, and today, at the age of 62, he is vice president of the Continental Oil Co."

In conferring the degree, Dr. Pontius declared:

"Walter Miller, distinguished engineer and executive, a leader in scientific and industrial progress, your vision, intelligence and industry have placed you in the forefront of your chosen field, and the results of your work have been of great value to mankind.

"In recognition of what you have done and of what you are, upon recommendation of the dean and faculty of the College of Engineering and by the authority vested in me by the board of trustees, I confer upon you the honorary degree of doctor of engineering in the University of Tulsa, with all the rights and privileges appertaining thereto."

Native of Switzerland

Dr. Miller was born in Switzerland and came to the United States as a small boy, living in New York and Elizabeth, N. J. There he completed his elementary school education. As a youth he worked as a machine hand, blacksmith helper, bookkeeper and held responsible positions with a picture-producing company.

In 1909 Dr. Miller went to the Bayonne, N. J., refinery of the Tide Water Oil Co., as a yield clerk. His spare hours were spent in attending night school. His interests were chemistry, accounting and engineering. At Bayonne he reached the rank of process superintendent and then resigned to join the old Pierce Refining Co. of Tulsa as general superintendent of three refineries. Six months later he was made refinery manager for Cosden & Co., now the Mid-Continent Petroleum Corp.

He entered refinery consulting work in Tulsa and during the latter part of 1921 was retained by the old Marland Oil Co. On January 1, 1922, he took full charge of Marland refining operations. When the Marland company was merged with Continental Oil Co., in 1929, he continued as vice president in charge of manufacturing, his present position.

Liberty Ships May Be Named for Oil Pioneers

Edwin L. Drake and Orville P. Taylor, pioneer oil men, have been added to the list from which the Maritime Commission selects names of future Liberty ships.

The move to obtain recognition for the oil industry and two of its pioneers was started several weeks ago by John P. Herrick, of Olean, N. Y. His proposal was endorsed by the National Petroleum Association, the New York State Oil Producers Association and other trade organizations.

Mark O'Dea, director of public relations of the Maritime Commission, advised Mr. Herrick that the names of Messrs. Drake and Taylor qualify under the policy of naming Liberty ships after deceased Americans who have contributed notably to the history and progress of the United States.

R. L. Langenheim, dean of the engineering school, looks on as Walter M. Miller, vice president in charge of manufacturing for Continental Oil Co., receives the honorary degree as doctor of engineering from C. I. Pontius, president of the University of Tulsa

Trend of Manpower and Materials Charted at Houston A.P.I. Meeting

by Harry F. Simons and T. F. Smiley

HOUSTON, Tex.—The manpower and materials shortages in the oil industry came in for somber consideration at the Houston meeting of the A.P.I. Southwestern district April 29 and 30. The technical papers which provided the program for one session were likewise linked closely with the oil industry's war effort.

In a brief talk opening the initial session, R. O. Garrett, Arkansas Fuel Oil Co., Shreveport, La., chairman of the Southwestern district, explained that decision to hold this spring meeting had been reached only after discussion and correspondence convinced officers and committees that a meeting would further the war program. He expressed the hope that the meeting would help in solving problems brought to the oil and gas industry by war.

Significant of the deep interest in this wartime conference of production men, every seat in the ballroom was filled at practically all the sessions, and many stood.

Seriousness of the manpower shortage was emphasized in three scheduled addresses and one added to the Friday afternoon program. The latter, by Chase Sutton, manager of the Gulf Coast division, Pure Oil Co., Houston, brought out that war, an industry of mass destruction, required practically the same materials as the constructive enterprises of peacetime. Even the essential industries, including oil, must realize the Army's requirements and make arrangements to meet them, he said.

Two Remedies Available

At present the petroleum industry has two means of relieving the manpower shortage, according to Mr. Sutton. The first is occupational deferment, which applies to essential men and affects a comparatively small number of employes. The second is the manning tables and replacement schedules suggested by the War Manpower Commission for individual studies of an employer's manpower position. This permits a company to predetermine when certain employes are likely to be called up, so that arrangements can be made to fill the gaps.

Mr. Sutton said the present situation developed because the industry as a whole failed to recognize the shortage of skilled workmen soon enough, failed to impress employes with the essentiality of their tasks, and failed to place the labor requirements of the oil industry before governmental agencies. He pointed out the risks involved in using unskilled personnel and failing to establish adequate training programs.

Several technical papers delivered at the southwestern district A.P.I. meeting at Houston are presented in the Engineering and Operating Section of this issue. Included are papers and flow charts on the Katy cycling plant, use of direct-current rigs in deep drilling operations, use of materials in secondary recovery and removal of paraffin accumulations in University field of Louisiana

Everyone should convince himself of the seriousness of the situation, should determine to do something about it and should develop a corrective program, Mr. Sutton said. Close contact with the local selective service boards, elimination of layoffs (possibly through cooperation of companies), and the training of employes unlikely to be drafted for essential tasks were the suggested remedies.

The WMC is fully aware that the finding, production and refining of oil will continue to rank in essentiality with food, transportation, ammunition, guns, tanks and planes, said Henry LeBlanc, acting regional director of the WMC, Dallas, Tex., in a paper read by A. C. Martin, of the same agency. All industries will have their troubles, and only one group, the armed forces, will continue to operate with a full staff of manpower.

"A total labor force of at least 62,500,000 will be required in the United States this year," Mr. LeBlanc continued. "Between 10,500,000 and 11,000,000 will be in the armed forces by the end of 1943, 2,500,000 to 3,500,000 will be required for agricultural work at the peak season and nearly 18,000,-

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D. V. Carter, Magnolia Petroleum Co., new district chairman; A. W. Baucum, Texas Co., Houston, Tex., secretary-treasurer and Fred Shields, Shields Oil Co., San Antonio, Tex., vice chairman for the Gulf Coast, conferring at the meeting

SCRAP: Here's How Standard of New Jersey Has Organized for Continuous Drive

by J. P. O'Donnell

NEW YORK.—The continuing need for the collection of scrap material of all kinds and for the conservation of existing equipment makes it imperative that all industrial companies continue and, if possible, expand their waste elimination and salvage programs. The best results of such drives were naturally attained in the first weeks or months of their existence when opportunity and enthusiasm were greatest. However, the need remains and in some respects is more acute than it was 8 months ago when nation-wide drives were at their peak. This is particularly true of waste elimination but is also applicable to salvage.

Among the companies which undertook a systematic program and are still pursuing it with highly satisfactory results, is the group of domestic affiliated companies of the Standard Oil Co. (New Jersey). The success of this company's campaign is attested by these facts: (1) Collections for all of 1942 were 2½ times the collections for the previous year; (2) the volume of current collections remains sufficiently high to warrant a continuation of the full program.

In this connection it should be stated that the company has extended its efforts toward salving all possible materials and idle equipment for replacement and new projects. In many cases they are reconditioned in the company shop or outside shops. When the necessity for intensive scrap collection became evident, all domestic affiliates of the company proceeded to study the possibilities for improving their existing salvage programs. The first decision was to invest in one individual the responsibility for coordinating a program and, as a result, all domestic subsidiaries and affiliates of the company were visited to exchange information and to devise a general policy. Basic principles of the program which was adopted and is now in effect, follow:

1. Disposal of scrap should be made by the accumulating units to their usual outlets.

2. The amount of savings to be directly realized through prices received for scrap should not be the dominant factor in governing the decision to sell.

3. All materials and plant equipment not in active service should be reviewed to determine if they should be scrapped except standard storehouse, and insurance items, purely temporarily idle equipment, etc.

4. Questionable idle pieces of equipment should be presumed to be free and available unless proved to the contrary. The burden of proof should rest on those desiring retention.

5. In order to carry out the principle of centralization, each operating group or plant shall appoint one individual or a small committee to carry on the work in that unit.

6. Emphasis was laid on two possible additional sources of scrap: (a) general housecleaning which would include cleanup around shops, tank fields, process-operating units, shop benches, abandoned bulk plants, etc., and (b) more intensified programs for dismantling idle equipment including stills, towers, abandoned pipe lines and idle power-generating or transmission equipment.

7. All companies agreed to submit,

Whole banks of old stills and other refining facilities are being dismantled at refineries where equipment is not currently in service

Report for December of Materials Reported Sold as Scrap by Domestic Affiliates of Standard Oil Co. (New Jersey)

Company and unit—	Ferrous materials (long tons)	Copper, brass, bronze, etc. (lb.)	Rubber* (lb.)	Paper (lb.)	Miscellaneous Pounds	Miscellaneous Material
Standard Oil Co. of New Jersey, Bayway refinery	668.0	112,000	.....	.....	.....	.....
Standard Oil Co. of New Jersey, Bayonne refinery	466.0	.....	.....	15,904	134	Tin cans
Standard Oil Co. of New Jersey, Baltimore refinery	44.1	.....	.....	500	4,074	Steel turnings
Standard Oil Co. of New Jersey, Charleston refinery	4.3	.....	.....	.....	.....	.....
Standard Oil Co. of Louisiana, Baton Rouge refinery	628.0	39,200	3,808	12,297	313	Aluminum
Colonial Beacon Oil Co., Everett refinery	43.3	1,520	.....	7,900	.....	.....
Peoples Natural Gas Co., all divisions	49.5	.....	.....	3,340	.....	.....
East Ohio Gas Co., all divisions	25.7	2,240	224	10,976	224	Lead
Hope Natural Gas Co., all divisions	123.9	4,592	680	.....	.....	.....
Oklahoma Pipe Line Co., all divisions	1.9	.....	.....	.....	.....	.....
Standard Oil Co. of Louisiana, pipe line	29.8	6,249	.....	.....	3,382	Batteries
Standard Oil Co. of Pennsylvania, manufacturing	1.4	.....	.....	.....	4,780	Assorted
Standard Oil Co. of New Jersey, marine	.....	.....	.....	.....	5,200	Rope
Standard Oil Co. of New Jersey, sales	22.9	218	1,493	16,584	4,696	Assorted
Standard Oil Co. of Louisiana, sales	2.0	.....	.....	.....	6,200	Lead
Colonial Beacon Oil Co., sales	19.2	199	.....	.....	1,270	Batteries-lead
Tuscarora Oil Co., all divisions	13.0	1,568	.....	.....	.....	.....
Humble Pipe Line Co., all divisions	58.3	.....	.....	.....	.....	.....
Humble Oil & Refining Co., all divisions	542.1	31,152	710	.....	36,600	Assorted
Total December	2,743.3	198,938	6,915	67,501	66,873	.....
Previous total	38,703.9	869,760	400,092	952,678	686,930	.....
Total Jan. 1, 1942 - Dec. 31, 1942	41,477.3	1,068,698	407,007	1,020,179	753,803	.....

*Figures for rubber do not include collections from the public at stations, etc.

at the end of each month, a report showing weights and materials sold and to whom sold, the report to be divided into ferrous, nonferrous, rubber, paper and miscellaneous materials. These reports are sent in on standard mimeographed forms to the individual assigned to coordinate the program. It is his duty to prepare a consolidated report which is submitted to the Salvage Section of the WPB in Washington and copies are distributed to the branches of the company who have supplied the information.

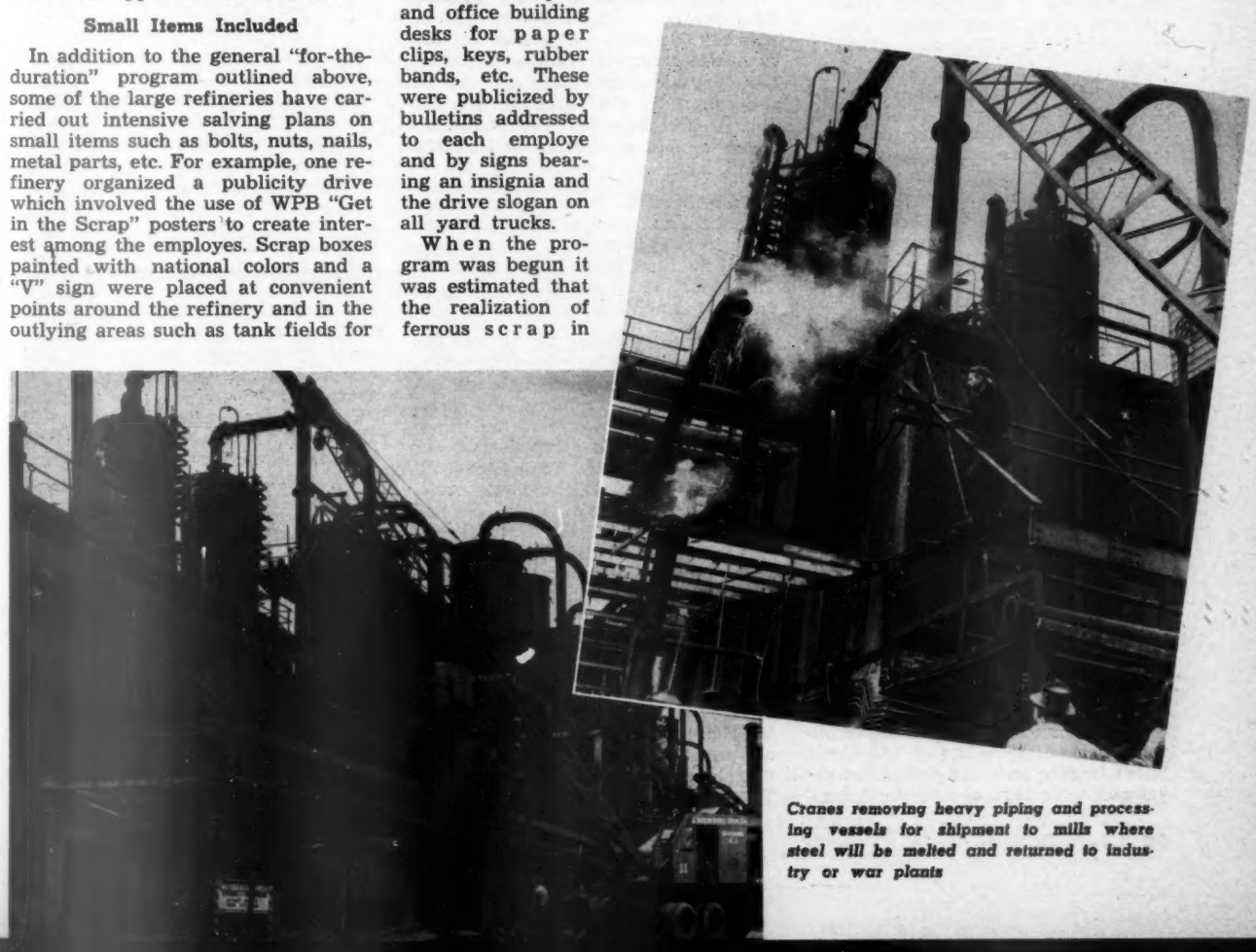
Small Items Included

In addition to the general "for-the-duration" program outlined above, some of the large refineries have carried out intensive salving plans on small items such as bolts, nuts, nails, metal parts, etc. For example, one refinery organized a publicity drive which involved the use of WPB "Get in the Scrap" posters to create interest among the employes. Scrap boxes painted with national colors and a "V" sign were placed at convenient points around the refinery and in the outlying areas such as tank fields for the collection of small scrap. Fifty-six boxes were used, resulting in the collection of 380,000 lb. of small items in a 7-week period. This scrap was taken to the reclamation department for segregation.

In connection with this drive, this refinery also conducted other campaigns: (1) National key-collection drive by placing receptacles at convenient locations; (2) a suggested cleanout of trunks of employes' cars parked at the plant; (3) thorough cleanout of yard and office building desks for paper clips, keys, rubber bands, etc. These were publicized by bulletins addressed to each employe and by signs bearing an insignia and the drive slogan on all yard trucks.

When the program was begun it was estimated that the realization of ferrous scrap in 1942 would exceed by 50 per cent the amount scrapped in 1941. Accordingly, a total of 24,800 long tons was expected to be collected. Actual tonnage greatly exceeded the goal. The amount of ferrous scrap sold in 1942 aggregated 41,477 long tons which was nearly double the amount anticipated. Large increases were also attained in nonferrous materials, rubber, paper and miscellaneous items. A summary of the collections for 1942

(Continued on Page 179)



Cranes removing heavy piping and processing vessels for shipment to mills where steel will be melted and returned to industry or war plants

Oil Stocks Are Below Efficient Levels on East Coast, PIWC Told

WASHINGTON, D. C.—Petroleum stocks available for civilian use on the East Coast are still at critical levels and are lower than previously forecast and too low for efficient operation, the committee on petroleum economics reported to the regular meeting of PIWC May 4.

The committee did not issue a detailed report on supply and demand this month as it usually does, chiefly because of its inability to obtain from military authorities any estimates of requirements of the Government which is the industry's largest customer. Instead it issued a brief statement which said:

"The reduced stocks are due partly to increased military demand and partly to the fact that total deliveries of petroleum to the East Coast during April were about 75,000 bbl. a day less than expected due mainly to late opening of the Great Lakes navigation season.

"Civilian consumption must remain for the present at the minimum level possible without disruption of essential civilian and industrial activities, in order to make available the maximum volume of supplies for military use, and to build up industry working stocks to efficient operating levels.

"Stocks will begin to build up and larger supplies will be available for military use during May and June, the committee reported, because the close of the heating season will bring a seasonal decline in civilian consumption and more transportation will be available.

"The committee called attention to the estimate in its April report of a need for greatly increased crude-oil production by the end of the year, and endorsed the views of Secretary Ickes in his letter to the Office of Price Administration recommending an increase in the price of crude oil."

Sizes and Specifications of Tubular Goods Cut in Half

WASHINGTON, D. C. — To help meet the increased demands for oil-country tubular goods the War Production Board April 30 issued a simplification schedule which cuts in half the number of permitted sizes and specifications.

Schedule 9 to Order L-211 (national emergency specifications for steel products) limits the production of oil-tubular goods to a list of 168 items, based largely on a simplified list developed some time ago by the American Petroleum Institute. Formerly, more than 300 items were produced by the industry.

The schedule is expected to result in a tubular-goods production increase of about 15 per cent and ease the burden placed on mills by requirements for pipe lines, munitions and other essential equipment.

Casing, tubing, and drill pipe are covered by the order. The schedule makes exceptions for oil-well casing produced by electric fusion welding, for orders entered prior to today, provided delivery is made before June 30, and in certain cases for items with special thread dimensions or types of joints.

DEATHS

Tom H. Riley, drilling contractor of Grand Rapids, Mich., died recently from a kidney ailment. Mr. Riley, with his brother Jack, went to Grand Rapids 4 years ago and operated as Riley Brothers in the drilling contracting business. More recently he has been operating independently.

L. J. F. Morison, for 20 years, was an officer of Petroleum Rectifying Co. of California, died in Los Angeles on April 16. He had been affiliated with the oil industry since 1910 except for a period during World War I when he served in a government position with the Grain Administration. In 1920 he joined Petreco as assistant secretary and was elected secretary the following year. At his retirement in 1940 because of poor health, Mr. Morison was secretary-treasurer and a director of Petrolite Corp., Ltd.

H. P. Parker, 51, who had served as chief gager for a pipe-line company in Greggton, Tex., since discovery of the East Texas oil field in 1931, died last week. His widow, three sons and two daughters survive.

Ernest Percy Rowe, 74, oil and gas consultant, died at Toronto, Ont., Canada, April 21. Connected with the natural-gas and mining industries since 1898, Mr. Rowe at various times organized or acted as consultant for Petrol Oil & Gas Co., Acme Gas & Oil Co. and Ajax Oil Co., and was president of Prairie Gas & Oil Co. He had been a director of the Natural Gas and Petroleum Association of Canada, and was especially active in connection with deep drilling of the Trenton limestone formation in Ontario fields.

Michael Patrick Hanlen, 93, retired oil man, died Saturday night in a Tulsa hospital after a long illness. Mr. Hanlen, who was acclaimed "grand old man" of the 1939 International Petroleum Exposition, had lived in Tulsa for 12 years, coming here from Bartlesville, Okla. He had been a resident of Oklahoma for 35 years. A native of Oil City, Pa., Mr. Hanlen entered the oil business as a young man and followed the westward trend of the industry. He is survived by a son and a daughter.

Thomas Elmer McBride, 49, former Tulsan, died suddenly in Oilton, Okla., of a heart attack last week. Mr. McBride was employed by Texas Co. and had been transferred from Tulsa to Oilton 5 years ago. His widow, two daughters and four sons survive.

Claude M. Hampton, 31, who was employed on a pipe-line construction job by Williams Brothers, Tulsa contractors, was fatally injured by an overturning tractor at Waynesburg, Pa. His widow and two children survive.

Burley Choate, 39, oil-field worker, was killed in a 55-ft. fall from a derrick in the Oklahoma City field. He was employed by Big Chief Drilling Co.

Osage Drilling Co. Sells 57 West Texas Wells

FORT WORTH, Tex.—Osage Drilling Co. last week sold to General American Oil Co. of Dallas, Tex., 57 producing wells in the Wasson, Seminole and Emma pools for $3,250,000. Osage received $1,250,000 cash and will be paid $2,000,000 out of 30 per cent of gross production. When the $2,000,000 oil payment has been amortized, Osage will receive a one-third working interest in the properties.

V. B. Likins, Oklahoma City, Okla., is president of Osage, and G. E. Hall, of Midland, Tex., is vice president and general manager.

Twenty-Eight Tankers Added to Fleet Program

WASHINGTON, D. C. — The number of new oil tankers scheduled for construction before the end of 1944 was swelled last week to 234, an increase of 28.

Contract for construction of the 28 additional tankers was awarded to Alabama Dry Dock & Shipbuilding Co., Mobile, Ala.

Woodley Petroleum Buys Llano Oil Co. Control

Woodley Petroleum Co., Houston, Tex., has purchased 99½ per cent of the outstanding stock of Llano Oil Co., Oklahoma City, Okla. Llano has eight producers in the North Cowden field in Ector County, Texas, and an interest in other producing properties in Andrews, Ward and Winkler counties. Headquarters of the firm has been moved to Houston.

NATURAL GAS SECTION

Diminishing Deliverability Of Natural Gas Compelling Consideration of Industry

by Burt R. Bay

FORTUNATELY for those of us living in the United States, a benevolent Creator endowed our country with a large supply of natural gas. This has been harnessed and put to work, and of great importance in this hour of need is the fact that it has been made available for use in most of the centers of industry throughout the country. Equally important is the fact that it now supplies some of the essential domestic needs of about one-third of the nation's population. In other forms, natural gas or some of its constituents finds its way into the manufacture of motor fuel, it becomes a component of aviation gasoline where it serves in all of the theaters of war. It adds strength and resistance to wear to the tires used on jeeps, trucks, and flying fortresses. It becomes a principal element of synthetic rubber. It serves to inflate the blimps that patrol our coast lines, and it takes form and is used otherwise as solvents, plastics, and explosives. What more need be said of the worth of this product in times of war, a product of an industry that is still youthful and retains its virility, yet one that is sufficiently old in experience to have attained the respectability of tradition.

Long before December 7, 1941, when war was forced upon the American people, the natural-gas industry was keenly aware of the many new burdens and responsibilities that even then seemed inevitable. It was also aware of the fact that with the advent of war, these would be added to the normal requirements of the peacetime pursuits of the industry and the need for our product would continue to grow with the passing of time in somewhat direct relationship with the increased tempo of war manufacturing. The men of the industry accepted this challenge and the results are clearly written in the record of the industry's performance to date which discloses that all previous totals of production and consumption have been exceeded by substantial margins. This has been accomplished partly by the preparations made in advance of the outbreak of war and more recently, with the advent of all of the restrictions upon the use of critical materials, by operating our plants at a higher rate of efficiency. The sheer will to accomplish more to help the war effort cannot maintain this upward curve of performance indefinitely and sooner or later, unless the problems of the industry are recognized by the governmental agencies in control of the supply and distribution of materials, we shall cease to register gains and may slip backwards. After all, the maintenance of our stock in trade, natural resource that it is, requires a never ending expenditure of labor and materials in the drilling of wells and the lifting and laying of pipe lines as old fields give out and new ones are developed. We cannot suspend this type of operation year after year and continue to contribute to the war effort on the present scale. Neither can we make a greater contribution unless there is recognition of all of the needs such an obligation entails.

Possibly more expressive of these points are some of the data contained in recent reports pertaining to the natural-gas industry. Net additions to "utility plant" of the entire industry for the year of 1941, which includes investments in gas pipe line and distribution properties, involved the expenditure of about 120 million dollars. While complete data for 1942 are not yet available, it seems certain that like expenditures will only be a fraction of the 1941 total.

Singling out the item of gas-well completions, the record discloses that there were 2,911 wells drilled in the year of 1941 and the average of such completions for the 5 years ended with 1941 was 2,501. For the year of 1942, the number of gas wells drilled was only 2,089 which was 822 less than the total for 1941. The conclusions I draw from this brief and admittedly incomplete showing of the situation presently confronting the industry are that within reasonable limits, the capacity of pipe-line systems to transmit gas is frozen until

This paper and those appearing on editorial pages 66 to 99 in this section were presented at last week's Natural Gas Management Conference in Cincinnati, Ohio. The conference replaced this year the regular annual meeting of the Natural Gas Section, American Gas Association. The papers give a concise summary of the operating problems confronting the natural-gas operations under restrictions of a wartime economy and afford a glimpse into the future of the industry.

greater amounts of steel are made available and with regard to supply, the margin of difference between the total deliverability of all producing gas wells and the capacity of existing transmission facilities is a gradually reducing quantity. In some producing areas, this latter condition is not yet a matter of moment but in others it is one that compels consideration now.

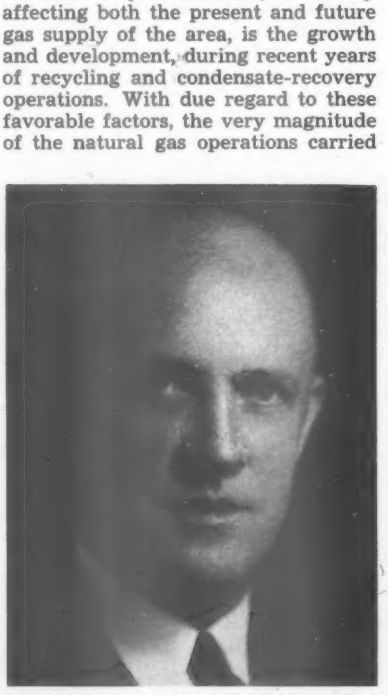
Supply Poses Problems

Any analysis of our gas-supply problems by areas poses some odd and radically different situations. By way of illustration, there are some 54,000 producing wells in the entire country, exclusive of combination wells producing both oil and gas, and of this total number of gas wells, 42,000 are located in New York, Pennsylvania, Ohio, West Virginia, and Kentucky, which comprise the Appalachian area. The annual volume of natural gas currently produced and marketed in such area exceeds 400 billion cubic feet, which approximates 15 per cent of the total of all marketed natural gas. To maintain this rate of production, during recent years, 53 to 70 per cent of the total of all new gas wells completed have been drilled within these five states. The natural gas produced in the Appalachian area, aside from supplying the domestic and commercial needs of some 3 million domestic and commercial consumers, has long been the prime fuel for countless specialized manufacturing processes throughout this highly industrialized area. Therefore, the continued maintenance of a supply equal to the total requirement imposed by all consumers becomes a matter that can neither be cast aside nor treated lightly. The answer to the immediate situation in this area probably lies in increased drilling—the long-range view points toward the need for the importation of gas from other producing areas.

In those middle western and Rocky Mountain states which afford substantially all of the market outlet in the area lying north of New Mexico, Texas, Arkansas and Kentucky, the current annual rate of consumption of natural gas for all purposes closely approximates one-fourth of the total of all marketed natural gas in the country. Of this total of some 750 billion cubic feet, about 40 per cent originates in the Hugoton and Texas Panhandle field where, generally speaking, the reserves are ample and the maximum rate of withdrawal by pipe lines is not excessive. There are, however, local situations and conditions applicable to each of these producing fields that merit and will require consideration with the passing of time. The remaining 60 per cent of the supply of these states has its origin in some 250 different gas fields or producing areas. A few of these sources of natural gas might be classified as flush, others have declined considerably and some will soon reach the point of abandonment. Quite a lot of concern already exists in the minds of the executives of those companies whose properties are dependent to any considerable extent upon the latter sources of supply. The remedy lies in making available to such companies, enough steel to drill needed wells and to extend facilities to other sources of supply as the total gas reserves of the area are entirely adequate if gas from the more prolific sources can be made available to sections and communities where there is evidence of an impending shortage.

Southern Area Favored

Some of the most prolific of the known sources of natural gas are in Texas and Louisiana. With large reserves available in these states and lesser reserves in adjoining states, market outlets of tremendous proportions have been developed throughout the South. Stated in another way, five southern states, New Mexico, Texas, Arkansas, Louisiana, and Mississippi, produce approximately half of all the natural gas marketed in this country and they consume within their own borders almost 80 per cent of the gas they produce. Oddly enough, these states produce this volume of gas, except as it is supplemented with casinghead residue gas, from about 10 per cent of the total number of all gas wells, which attests to the nature of the available supply. Another major influence, favorably affecting both the present and future gas supply of the area, is the growth and development, during recent years of recycling and condensate-recovery operations. With due regard to these favorable factors, the very magnitude of the natural gas operations carried on in these states, the constantly growing fuel needs of an expanding southern industry, and the diverse nature of the different sources of gas supply all contribute to the problems of the industry in this area and add to their complexity in wartimes.



Burt R. Bay, president of the Northern Natural Gas Co., Omaha, Neb., is chairman of the Natural Gas Section, American Gas Association, and presided at last week's management conference

On the West Coast, substantially all of the natural gas is produced and consumed in California. There the producing situation is somewhat unlike that existing in any other section of the country. Current annual rate of production and sales of natural gas in the state, as in the Appalachian area, approximates 400 billion cubic feet. Ordinarily less than 10 per cent of this volume is produced as dry gas from gas wells and more than 90 per cent of the total is produced in conjunction with oil. Since the preponderance of California's natural-gas supply is essentially a product of oil operations, the rate of gas production is affected by the rate of oil production. The two operations being so closely related, present the country's most novel natural-gas production complexity. Drilling problems are largely oil-development problems as the dry gas portion of the total supply is produced from a comparatively small number of gas wells. The whole matter of gas supply is one that taxes the ingenuity of the two industries at times and compels close coordination of effort, especially under war conditions.

More Drilling Needed

Viewed in a broad sense, the natural-gas-industry-development problem, except as it is influenced by variations in the supply of casinghead-residue gas, appears to sum up about as follows: An analysis of government statistics shows that for the 5-year period, 1937 to 1941, inclusive, 992 new dry gas wells were completed for each trillion cubic feet of natural gas utilized and marketed. A recent report of the Texas Mid-Continent Oil and Gas Association contains an estimate which places the total of all marketed natural gas for the year of 1942 at approximately 3.4 trillion cubic feet. Accepting this estimate and using the 5-year average drilling experience per unit of volume marketed, the industry might reasonably have completed 3,373 new gas wells during 1942 to offset the decline in the available supply, instead of the total of 2,089, actually drilled which was about 40 per cent less than the indicated need.

The second phase of the gas-supply problem, like the ever-present requirement to drill new gas wells in productive areas, is that which arises through necessity to augment the gas supplies of partially depleted fields where development is no longer practicable. This may resolve itself into need for installing compressors, looping existing pipe lines or laying en-

(Continued on Page 97)

Natural-Gas Pipe Lines Have Prospect of Rapid Expansion

by Paul Reed

Large natural-gas pipe-line projects already authorized and important proposed projects now under construction indicate that much construction will be needed to meet wartime industrial and domestic demands which have grown while normal expansion was retarded last year by the steel shortage. Already 130,000 tons of steel have been allotted to these programs.

A MARKED change has come in the outlook for expanding natural-gas pipe-line facilities this year. Already work has started on a huge program for supplying gas from the Panhandle-Hugoton regions for the first time to the Cleveland-Akron-Youngstown, Ohio, industrial areas.

An allotment of 130,000 tons of steel has been assigned by WPB for transmitting natural gas to points where it is vitally needed for the national program. Construction projects utilizing this will probably cost more than $45,000,000. As the year progresses it is possible that additional important work will be done, for the history of the business shows that estimates of construction made in the spring are usually exceeded by accomplishments before winter comes.

The present situation contrasts with the one at the beginning of last year when the impact of the war could not be comprehended. At that time, several large projects were confidently proposed before curtailment of steel for pipe lines became most acute. Natural-gas pipe lines laid last year were primarily for serving military establishments and certain definite war industries. A broader program is planned for 1943 to furnish natural gas to extensive areas whose needs can be better understood after a year of wartime industrial expansion.

Major Projects Considered

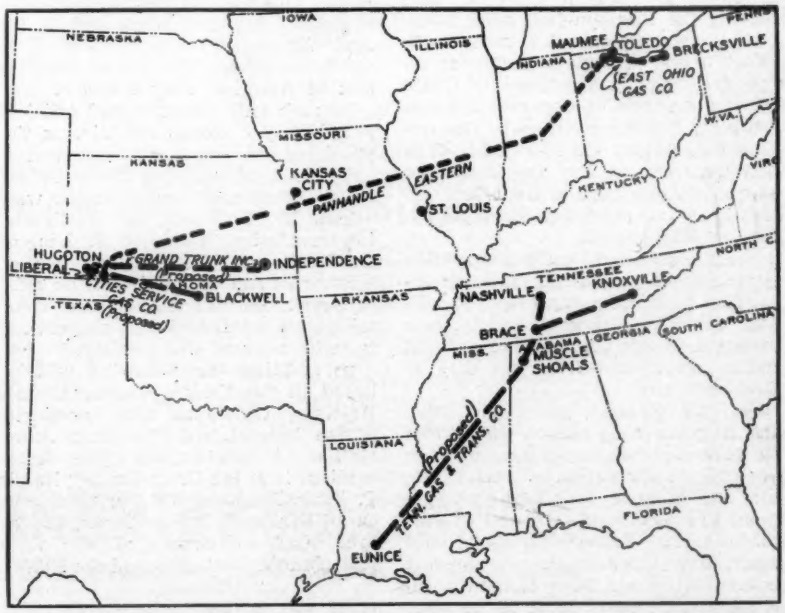
In addition to providing more gas for a zone stretching from Detroit, Mich., to Youngstown, Ohio, which has had foremost consideration in the national gas-line planning this year, much attention is given to increasing natural-gas supplies to Wichita, Kans., and Kansas City, Mo. Furthermore, a large project for furnishing southern Louisiana gas to Tennessee war industries and possibly to Ohio and Pennsylvania industrial centers is to be considered by FPC within a few weeks.

The most important gas-producing area to be utilized by 1943 projects is the extensive Hugoton, Kans., field with its ample reserve. According to the conservative report of the District 2 petroleum-industry committee the present open flow of the 354 gas wells in the field is 4,614,639,000 cu. ft. Average production for the first 6 months of 1942 was 134,000,000 cu. ft. per day. This report gives withdrawals from the field to date as 290 billion cubic feet and estimates future reserves as 15.17 trillion cubic feet. It is obvious that proposed facilities as well as existing pipe lines in the field will be supplied for many years to come.

Panhandle Eastern Pipe Line Co. is embarking on an expansion program for increasing deliveries of gas from the Panhandle and Hugoton fields to its connections at Detroit, Mich., as well as for supplying the new line now being built by East Ohio Gas Co. for transmitting gas to the Cleveland-Akron-Youngstown industrial areas.

The Panhandle Eastern program involves the laying of loops between the Panhandle-Hugoton fields and Detroit, consisting of 122 miles of 26-in. and 85 miles of 24-in., making a total of 207 miles. Along the line, 19 slow-speed compressor units of 1,200 and 1,400 hp. will be added at approximately the same number of stations.

East Ohio will receive from Panhandle Eastern about 50,000,000 cu. ft. of gas daily for transmission to its present system through the 120-mile, 20-in. line now being built by the



Map showing principal authorized natural-gas pipe-line projects consisting of looping of Panhandle Eastern Pipe Line Co. system and construction of East Ohio Gas Co.'s Maumee-Brecksville, Ohio, line as well as proposed projects of Cities Service Gas Co., Grand Trunk, Inc., and Tennessee Gas and Transmission Co.

company between Maumee, Ohio, near Toledo, to the Brush Farm valve station at Brecksville, Ohio, 14 miles south of Cleveland. The 50,000,000 cu. ft. to be transmitted is said to be about 30 per cent of East Ohio's present daily average sales. East Ohio is reported to have call for another 50,000,000 cu. ft. daily if Panhandle Eastern can deliver this amount. Approximately 22 per cent of East Ohio's supply has come from Ohio gas wells and 78 per cent from West Virginia gas wells.

While industrial consumption has increased 100 per cent in East Ohio's territory since 1938, domestic consumption having a priority demand went up 25 per cent at the same time. With the additional supplies arranged it is expected that there will be sufficient gas for industrial consumers for at least 2 years. This year it is believed that East Ohio will face a demand of more than 62 billion cubic feet.

The exact nature of the other important 1943 outlet from the Hugoton field has not been determined. Two applications have been filed for federal permits for new lines on which action is expected to be taken soon. Only one of these will be built.

Cities Service Application

Cities Service is reported to be seeking permission to build a 200-mile, 26-in. line to transmit gas from the Panhandle-Hugoton areas to a connection at Blackwell, Okla., with the company's system serving Wichita, Kans., and Kansas City, Mo.

Grand Trunk Pipe Line, Inc., affiliated with Union Gas System, Inc., proposes to build a 300-mile line, leaving the Hugoton field with 22-in. pipe extending east 200 miles to a point south of Wichita, Kans., at an intersection with two lines of Cities Service and one of Consolidated Gas Utilities, Inc. From there to the exhausted Elk City gas field now available for storage, the line would be 16-in.; beyond there to Grabham station near Independence, Kans., a 22-in. line is proposed.

Such a line could carry 200 million cubic feet of gas daily plus compressor fuel to Wichita Junction, 100 million cubic feet daily from Wichita Junction to Elk City storage and 150 million cubic feet from Elk City to Grabham.

As now planned, gas would leave the Hugoton field station under 750-lb. pressure and would pass through one compressor station between Hugoton and Wichita Junction, at which point gas would be delivered at 500-lb. pressure. East-bound gas would again be compressed. Compressor equipment would have 27,000 hp. including spare units. Most of the power would be concentrated at Station 1 in the gas field.

Grabham station is the closest point to Hugoton, according to reports, where there is access to a group of pipe lines, serving important markets which are not already loaded to capacity. Among these are the two Cities Service north-bound 16-in. main lines to Topeka, Kans., Kansas City, Mo., and St. Joseph, Mo. These are interconnected with the Welda gas-storage project. These two lines have a capacity in excess of 80,000,000 cu. ft. at present permissible pressures. There are also two 16-in. lines with an additional 80,000,000-cu. ft. capacity to Joplin, Mo., and eastward points including ordnance plants, camps, mining fields, etc. And Union Gas System, Inc., has two 10-in. lines in addition: one to Coffeyville, Kans., and the other to Independence and northward.

Storage available in the old Elk City gas field is 18 miles northwest of Grabham. This field has produced 23 billion cubic feet of gas from a relatively small well-defined reservoir. The average open flow of wells in that field was in excess of 33 million cubic feet per day with one well having an open flow of 90 million cubic feet. The load factor on the Hugoton line would be much improved by the use of this storage. In addition, the old Longton field in the vicinity could be used for storage.

Proponents of the Hugoton-Grabham project believe that carrying capacity of this pipe line should be available to lease owners of the Hugoton field so far as practicable. Proportions of capacity allotted would be determined by the owner's lease holdings, open-flow capacity of his wells and other outlets from the field which he may have. In this way gas from the field may be prorated for the benefit of lease owners. The line would be in the nature of a common-carrier pipe line providing an outlet which would not be exclusively controlled by any one company in so far as it dealt with production and distribution.

Steel required for the project would amount to 54,000 tons. In addition there would be other materials. Cost would be about $15,000,000. Financing of either the Grand Trunk or the Cities Service projects discussed would be by RFC.

On June 1, FPC will consider application of Tennessee Gas & Transmission Co. for permission to build a line from Eunice, La., gas fields which would be 24-in. in diameter via Muscle Shoals, Ala., to Brace, Tenn. From Brace the line would branch. One branch of either 16 or 24-in. would go to a point near Nashville, Tenn. The other, of 12-in., would serve Alcoa and Knoxville, Tenn. Lateral lines to industries in the Tennessee Valley and Chattanooga, Tenn., are contemplated. It is stated that the company is ready to consider changes in plans which make possible transmission of additional 100,000,000 or 200,000,000 cu. ft. of gas for delivery to existing systems serving eastern areas.

I.P.A.A. to Hear Government Speakers

ST. LOUIS, Mo.—Between 250 and 300 independent oil producers are expected here this week end to attend the 2-day midyear meeting of the Independent Petroleum Association of America, May 7 and 8.

Oil men and governmental officials will jointly consider and discuss the problems of increasing discoveries and those of assuring an adequate supply of crude to prosecute the war.

Sen. E. H. Moore, of Oklahoma. Representatives Clarence F. Lea, of California and Walter C. Ploeser, of Missouri, members of the House subcommittee on oil and the House committee on small business, respectively, will address the meeting.

In addition the following will be heard in the Friday sessions: Frank Buttram, Oklahoma City, president of the Independent Petroleum Association of America, on "The Independent is at the Cross Roads"; Ralph T. Zook, Bradford, Pa., on "War and the Oil Industry"; Paul Ryan, Cleveland, Ohio, chairman of the postwar planning committee of the PIWC, on "Postwar Planning for Independents"; N. T. Gilbert, general manager of Midstates Oil Corp., Tulsa, and treasurer of the association; Donald R. Knowlton, Washington, D. C., director of production, PAW, on "What Materials Will Be Available for 1943 Drilling Requirements"; N. C. McGowen, Shreveport, La., president of Union Producing Co., on "Where Will the Petroleum Industry Obtain Its Manpower?"

The Saturday meeting will also cover a wide range of questions important to the oil producer. Russell B. Brown, Washington, D. C., general counsel of the I.P.A.A., will speak on "The Petroleum Industry in Washington." H. B. Fell, executive vice president of the I.P.A.A. will give the report of the committee on crude-oil requirements, of which he is chairman. Walter S. Hallanan, Charleston, W. Va., president of Plymouth Oil Co., will speak on "The Price Incentive in the Production of Petroleum"; William R. Boyd, Jr., chairman of the PIWC, on "The Industry Needs the Independents."

Saturday afternoon there will be further discussion of the price incentive. A. C. Simmons, Bradford, Pa., will tell of the effect on secondary recovery of oil; A. S. Ritchie, Wichita, Kans., will speak on price and its relation to wildcatting and Charles P. McGaha, Wichita Falls, Tex., president of the National Stripper Well Association, will discuss price and the operation of the small wells.

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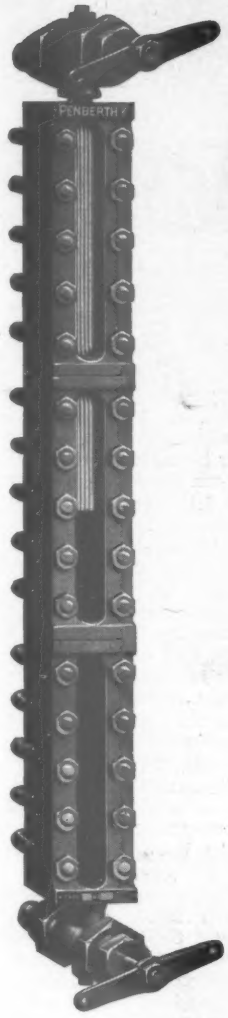

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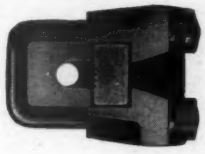

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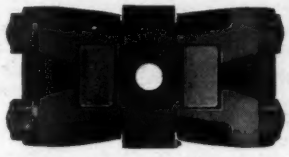

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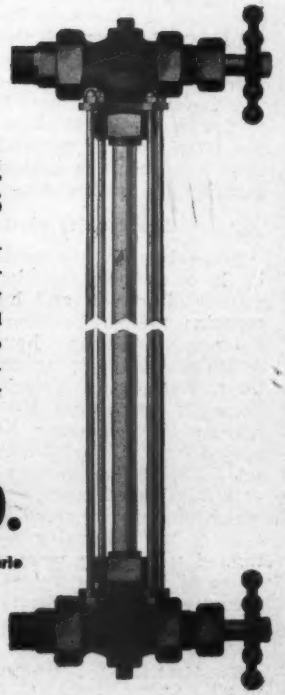

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Problems of the Natural Gas Industry Under War Conditions

*by K. S. Adams**

THE future of natural gas and its numerous derivatives has become a live subject in a world filled with uncertainties, in a world where new discoveries are changing the established order of things almost overnight. Although natural gas has, in the past, been regarded almost exclusively as a superexcellent fuel for use in special heating processes, it now appears that there are a number of other important uses, as in the manufacture of chemical derivatives. Consequently, it is only normal that we should speculate on the future of natural gas, on whether there are enough reserves to furnish future markets, and on whether those future markets will be as we have known them in the past or markets of a different character.

Each individual has his own idea as to what natural gas is. The consumer of natural gas as fuel knows that it is that substance which enters his premises through a pipe and produces the flame in his range, oven, or furnace. The producer knows natural gas as that substance which issues in a gaseous form from geological formations beneath the earth surface either with or without oil. Yet, there is quite a difference between the various gases, and we must go to the chemist's definition of natural gas—a mixture of paraffin hydrocarbons, existing in a gaseous form—to describe the differences.

Complexity of Gas

Natural gas, as the producer knows it, is a complex mixture of compounds of carbon and hydrogen. It contains methane, ethane, propane, butanes, pentanes, hexanes, etc., which are names given to the paraffin hydrocarbons, in various proportions. In most cases, the gas which reaches the consumer has had removed from it the latter members of this hydrocarbon series and remains as a mixture of methane and ethane which amounts to some 90 to 95 per cent of the original gas. Those extracted compounds were removed because at low temperatures and high pressures, they condense to liquids and interfere with gas transmission. For distinction, let us call the gas delivered through trunk lines or long-distance pipe lines for ultimate distribution to the consumer for fuel, "high-line gas."

This brings us to the subject of "derivatives." Webster says that a derivative is "a substance so related to another substance by modification or partial substitution as to be regarded as theoretically derived from it, even when not obtained from it in practice." This definition, as broad as it is, when applied to natural gas would cover practically all compounds composed of carbon and hydrogen. Therefore, let us limit our definition of derivatives of natural gas to those chemical compounds produced by using one or more of the constituents of natural gas as a raw material.

Status of Reserves

Having defined natural gas and derivatives of natural gas, and before proceeding with a discussion of each, it might be well to summarize briefly the statistics regarding gas reserves and the current rates of consumption. Natural gas, as you well know, is produced to some extent in 37 of our 48 states. The proven gas reserves in place have been conservatively estimated at 85 trillion cubic feet, and the potential and unproven reserves are estimated to be in the order of another 85 trillion cubic feet. Most of the proven reserves lie in the Gulf Coast and Mid-Continent areas. The consumption of natural gas in the United States in 1941 was 2.8 trillion cubic feet, and at this rate of consumption there are apparently enough proven reserves to supply our present requirements for approximately 30 years, and enough potential reserves for another 30 years or a total of 60 years. In this connection it is well to observe that the ratio of reserves to consumption has materially increased during the past decade. The petroleum industry is continually exploring for oil and gas, and it is believed by some that we have not begun to exhaust the possibilities of new discovery.

Gas fields from which the greater withdrawals are being made are those known as dry-gas fields — those in which gas is not associated with oil or distillate, and casinghead fields—fields in which gas is produced along with oil. There are many large fields known as distillate fields in which recycling operations are being conducted to recover the heavier hydrocarbons, while the merchantable gas is being returned to the formation and held in storage for future use. It is this gas which will make up a large portion of our supply in the distant future.

Control of Joint Operations

Recent emphasis placed on the urgent need of natural gas for the war effort as well as nonwar needs demonstrates the soundness of the current practices of closely controlling the natural gas produced in oil operations in such a manner that the gas may be conserved and the maximum oil production may be obtained. Reinjection of gas during the early stages of oil production, as in the case of the distillate fields, portends a future predictable gas-production rate compatible with economical pipe-line gas purchase practices; therefore, excess gas from future oil fields within striking distances of gas pipe lines will furnish a larger per cent of pipeline gas than in the past. Also recent gas repressure and storage programs

New developments of derivatives are permitting the natural-gas producer to obtain a market for the heavier fractions without appreciable effect on the amount of gas available for sale as a fuel. This review summarizes some of the more important trends to diversion of heavier fractions of natural gas to uses other than fuel, particularly in the manufacture of chemical derivatives. The author concludes that reserves are adequate to meet the demand for fuel and special products. He admonishes operators to pursue all research.

*President, Phillips Petroleum Co., Bartlesville, Okla.

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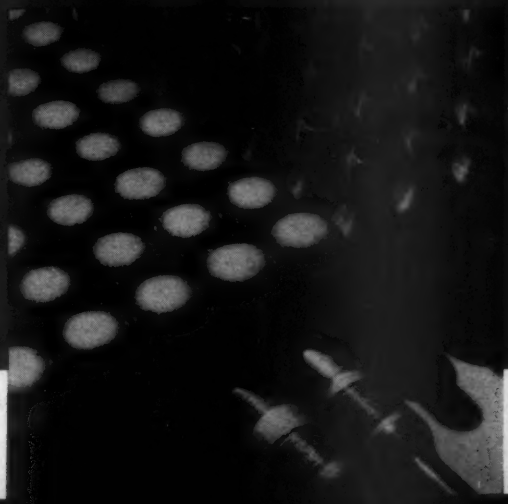

in semidepleted oil fields show that oil reservoirs may be successfully used for the storage of gas that can be advantageously used by gas pipe lines in the future.

While, in general, the oil producers have been quite successful in unitizing oil fields, cutting operating costs, and in many instances increasing ultimate recovery, there seems to be a lack of this type of operation among the gas producers in the strictly gas fields. The desirability of unitization of gas fields has not been sufficiently explored with its resultant greater recovery, and more stable operation.

In the past 15 years, we have seen several transcontinental natural-gas transmission lines come into existence. These lines have brought communities in the northern and eastern Mississippi Valley and the benefits of natural gas which the people of the West Coast, the midwestern area, the Gulf Coast, and the West Appalachians have long known. At the time of our entry into the war, there were additional pipe lines being proposed. As a result of our need for natural gas in defense activities, the existing pipe lines have been taxed to the utmost of their capacity and due to the more urgent needs for steel, the proposed pipe lines have not been built. There is every reason to believe that with the resumption of peacetime activities, not only will the existing lines be enlarged, but new lines will be built, thus bringing a better form of fuel and the resultant comforts to a larger proportion of our population.

Refrigeration Possibilities

"High line" natural gas has for years been used as a fuel. It is used in domestic ranges, water heaters, space heating, commercial establishments and industry. It was once used for lighting, but this has almost entirely been replaced by the incandescent electric bulb. We are now coming forward with gas refrigeration and even better gas residential year round air conditioning. To borrow the words of John K. Knighton, Servel, Inc., "We have every reason in the world to become excited about our possibilities, because of the peculiar suitability of the new absorption unit to residential requirements." We have all seen the insulated automatic water heater replace the older side-arm heater. There are many more developments to be expected in the future. In the past, new lines of ranges and water heaters have been attractive and serviceable, and they have had very good public acceptance. In the future they will meet equal acceptance, thus producing an increasing base load for our sales.

Commercially, "high line" natural gas has been found ready and adaptable for many uses, and will continue so in the future. There has always been a fairly extended use of commercial natural gas, and today we see many

K. S. Adams, the author, is president of Phillips Petroleum Co., Bartlesville, Okla., one of the largest manufacturers of natural gasoline in the country, a phase of operation that ties it intimately into natural gas. Phillips' work with products derived from natural gas gives its top executive a keen insight into the future

new establishments, which are using natural gas for food preparation, water heating, space heating, and miscellaneous purposes. Those who have found natural gas so adaptable in keeping up with changes in meeting their wartime commercial-fuel problems will not turn to an inferior fuel for their peacetime needs.

Industrially, "high line" natural gas is used wherever heat is needed. It has been used for various industrial processes during peacetime and is now being used for these same processes and many more in the manufacture of war materials. Natural gas is being used extensively in the fields of metal heating and heat treating. Acceptance of natural gas for these two jobs began long before the present emergency. The development of the radiant tube heating elements has opened a wide field in heat treating operations. Natural gas fuel is used in the fabrication of aluminum, in forging projectiles, to form glass, harden armor plate, harden cartridge cases, temper instrument mechanisms, anneal bright steel, anneal gun turrets, heat rivets, in soft metal melting, in continuous ceramic kilns for china, in the drying of foods, and in a wide variety of other heating operations.

During all of this increased demand on industry for the production of war materials, it has been learned that natural gas is not merely a fuel. The industrialist has learned that in a large majority of the industrial heat applications, natural gas is not only more economical but that due to technical utilization factors and process requirements, it also does an improved job and has become a necessary war material. Slowly and carefully, we are building up in industry a reserve of confidence in natural gas and a background of experience and development that is going to be extremely valuable in the future.

The chemical derivatives of natural gas have also come in for their share of attention. Although the more recent chemical developments, those which probably make newspaper headlines, are regarded as something new in the oil and natural-gas industries, since we hear them commonly referred to as "the new chemical developments," it should be understood that there is no definite line of demarcation between the preparation of chemical derivatives and the preparation of the more conventional gasoline and lubricant products of the refining industry. All products, whether they be classed as fuels and lubricants or as some special drug, are still chemicals in the strict sense of the word. Hence, the oil and natural-gas industries should for practical purposes, be regarded as chemical industries. One might say that we have merely broadened our field.

Chemical Production Progressing

A number of various chemical processes for the conversion of natural-gas hydrocarbons into new and useful products are already in commercial use in the petroleum refining and in other industries. Many other developments have been worked out in the research laboratories of the industry. It remains necessary for further research only to determine ways to reduce costs to the level of commercial practicability. When this has been done even more remarkable developments will become subjects for everyday discussion.

The natural-gas industry is interested in these developments for questions frequently arise as to their possible effects on such things as depletion of reserves, changing the characteristics of gas available for transmission and distribution, establishing new raw-material values for gas, opening new markets, and similar items.

A few of the newer technological developments which have resulted in processes utilizing oil and natural gas as raw materials should be mentioned —even though the ultimate possibilities of most of them will not be known for some time to come. Since there are a number of good reasons for believing that the influence of the newer chemical developments in the natural-gas industry will be slight, if not definitely beneficial, we would like to give brief considerations to some of those reasons before attempting any discussion of the new developments.

As we stated at the beginning, "high line gas" is largely composed of methane, and methane is the most refractory of hydrocarbons. By the term refractory we mean lack of sus-

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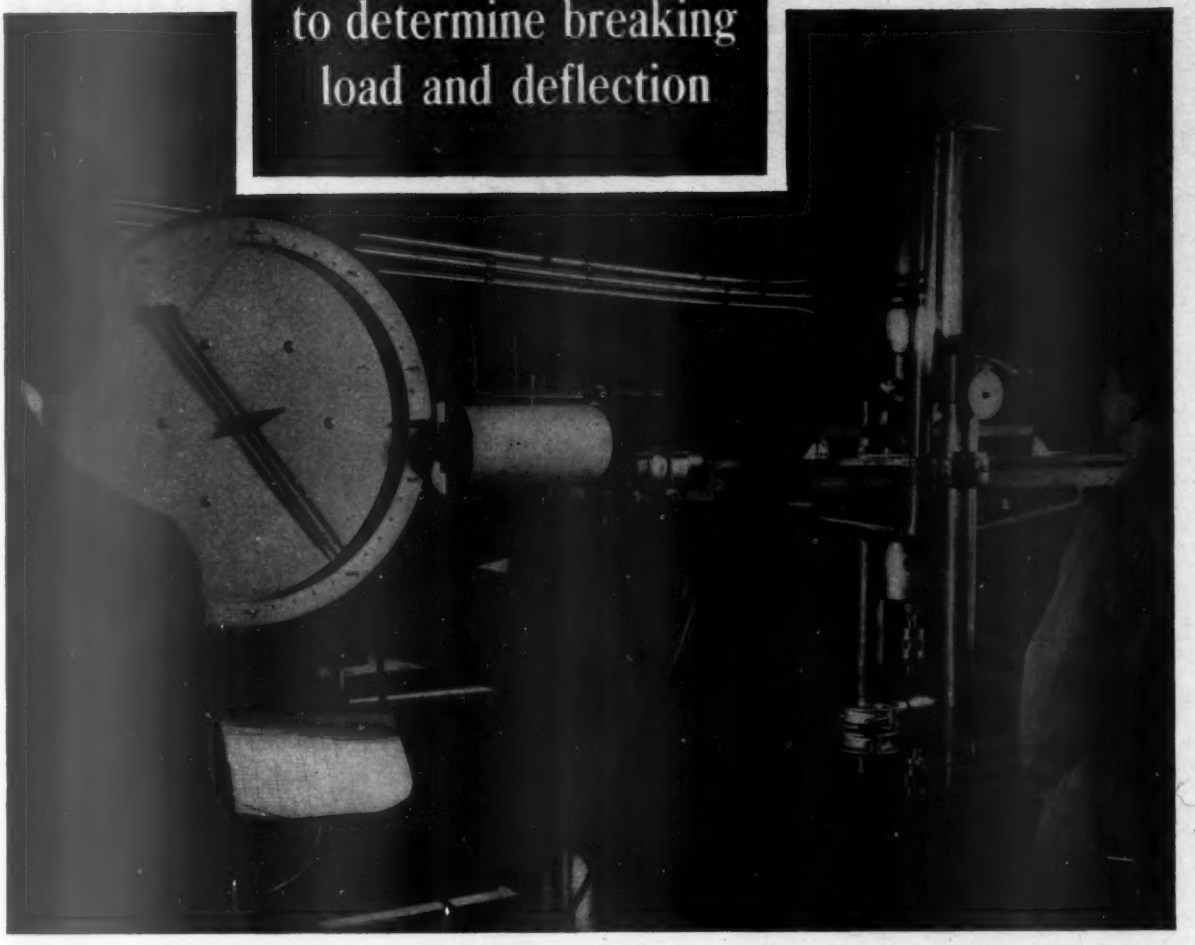

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ceptibility to conversion to other products. Methane is the most difficult hydrocarbon to break up into its components or other compounds. The chemical reactions applicable to methane are few in number and the outlets for the possible products of such reactions are still relatively limited when compared to the enormous supply of methane.

New developments of high-octane gasoline from natural gas, synthetic rubber, organic chemicals, solvents, explosives, etc., are largely built around those gas ingredients that are removed in processing gas for high-pressure transmission. These latter raw materials, the hydrocarbons (propane, butane, pentane, etc.) are fractions of gas which have hitherto largely been consumed in low-value utilization. Refinery gases are also an important source of hydrocarbons of this type. It should be kept in mind, however, that the amount of such materials present in natural gas of "high line" quality is negligible and their removal in general will tend toward uniformity and improved performance in appliances.

Chemical Outlets Small

This leads us, naturally, to the question of total raw-material requirements. For example, what sort of raw-material volumes are we speaking of when we look to the chemical activities as an outlet for gas even disregarding for the moment matters of gas composition, etc.? The best answer is that they are small — much smaller than the almost astronomical volume figures for fuels with which the gas industry is familiar. This is even true for those constituents other than methane. It has been estimated, for example, that the total potential markets, not restricted to "high line gas" hydrocarbons, which we can currently anticipate for hydrocarbon raw materials in the chemical industry would not be much more than twice the present marketed volume of liquefied petroleum gases. That might sound like a large volume, some 1,000,000,000 gal. annually; yet that volume is considerably less than 10 per cent of the total ethane, propane, and butane currently estimated as being annually available.

The limited size of the chemical markets compared to the usual outlets for petroleum is still more strikingly apparent from one or two specific examples. Thus, the prewar annual production of methanol, wood alcohol (both synthetic and from wood distillation), some 20,000,000 gal., could have been produced from a single gas well of 10,000,000 cu. ft. daily capacity if near perfect conversion efficiencies are assumed. The potential production of just one of our smaller gas wells would thus flood the market. Somewhat less than 1,000,000 cu. ft. of natural gas per day would theoretically furnish all of the carbon tetrachloride sold. We have chosen these examples because they are among the important chemicals from a volume standpoint.

Similar comparisons could be drawn for other chemicals. Thus, if all of the ethane annually available were quantitatively converted to ethanol, ethyl or grain alcohol, the astounding volume of 100,000,000 bbl. of ethyl alcohol would be the result. If ever we were to encounter such a thing as an alcohol famine, we might turn to the propane and butane available for another 200,000,000 bbl. The only thing we haven't been able to figure out is what to do with that final volume of 300,000,000 bbl. Another example is the much-discussed synthetic rubber. The volume of butadiene for buna rubber which could be made from the butanes annually available would result in a volume of rubber approximately five times that consumed in normal times. Is it any wonder, then, that the petroleum industry looks forward with confidence to the nation's current rubber problem? Raw materials are present in abundance.

The sum and substance of this situation is that outlets for natural-gas hydrocarbons in the strictly chemical industry are quite meager even if we include all the gas hydrocarbons.

Having demonstrated the probable effects on the gas industry of the manufacture of derivatives we will review briefly a few of the more outstanding developments in the field on converting natural-gas hydrocarbons, or more properly, light-petroleum hydrocarbons, into new products. In each instance, of course, it should be kept in mind that there are other routes to the ultimate products and these routes may involve the use of raw materials other than natural-gas hydrocarbons. The chemist has turned to natural-gas hydrocarbons only because they are ample and readily available. The same ultimate result might have been and might yet be attained in each instance by starting with coal, our other abundant supply of organic raw material.

New developments may be considered as falling into two major classes: (1) Those concerned with the conversion of hydrocarbons into liquid fuels of superior characteristics to natural or cracked liquid fuels, and (2) those concerned with conversion to other products. The volume of raw materials involved in commercial operations under the first of these classes is many times that involved in commercial operations under the second. It is for that reason that we discuss them in that order.

Liquid Fuel Production

The hydrocarbons we mentioned earlier, namely, ethane, propane and butanes, which are currently being used as raw materials in processes for the production of liquid fuels, occur in appreciable percentages in natural gases before processing for transmission and are also present in residual gases from refineries as byproducts of oil cracking. In the latter case, the subject hydrocarbons are, of course, associated with the corresponding olefin (unsaturated) hydrocarbons which have long been known as particularly desirable materials for chemical synthesis of various sorts.

The processes by which natural gases and the still more complex offgases of refineries are converted to liquid fuels are extremely complex since all of them involve one or more of the chemical reactions known as pyrolysis (decomposition by the action of heat), dehydrogenation (splitting off hydrogen), polymerization (recombination of hydrocarbons deficient in hydrogen), hydrogenation (addition of hydrogen, alkylation (com-

A compressor house at a New Mexico plant where certain natural-gas components are segregated for uses more valuable than as fuel

bination of unsaturated hydrocarbons with saturated hydrocarbons), and in some cases isomerization (internal rearrangement of molecular structures).

The earliest of these developments, low-pressure pyrolysis (thermal cracking) taught us that benzene, toluene, xylenes, and heavier aromatic products, formerly derived only from coal carbonization, could be produced from natural gas. This extremely versatile process not only can be made to produce the aromatics, but also the valuable olefin (unsaturated) hydrocarbons, which have so many uses in organic chemical synthesis. One of the olefins (ethylene) produced in this process is used in producing tetraethyl lead, neohexane, much of the industrial alcohol, and ethyl benzene, which is ultimately converted to the rubber and resin raw material known as styrene. The higher olefins, similarly produced, are raw materials for aviation gasoline and butadiene, the other important rubber material.

Conversion Processes

Next, high-pressure pyrolysis of natural gases gave the industry its first practical process for producing premium motor fuels from gases which were largely wasted prior to such development. It has been estimated that prior to the war, 30 per cent of the available butane was being used annually in this process as a raw material to produce approximately 15,000,000 bbl. of high-quality motor fuel.

Dehydrogenation, polymerization, and hydrogenation brought forth the production of isooctane and other high-octane motor fuels.

An astounding discovery along this line was announced a number of years ago, namely, that the proverbially inert hydrocarbons could be made to react with olefins to produce a saturated product. Fuels having octane numbers greatly in excess of 100, which will permit engines probably not dreamed of even 5 years ago, are now more than within the realm of probability through this newly discovered reaction. It is to this chemical reaction of paraffin alkylation, a tool which has many unexplored applications in the field of chemistry, that the United Nations owe their present superiority over the Axis nations in aviation fuels.

One of the most recent commercial processes — isomerization of normal butane to convert it to isobutane—has made available for isooctane alkylation a new supply of needed raw materials.

The volumes of selected fuels and selected fuel ingredients currently being produced is, of course, a military secret. We know that the volumes are large and that new facilities are constantly being created to make still larger volumes. No one can risk a guess as to what these fuels will make possible in the way of new pleasure cars and commercial aircraft for the simple reason that the same technological revolution is going on in other industries. Along with new light-metal alloys and new plastic materials of construction, the effect of fuel quality will be only one of the items which will cause us to scrap prewar models of cars and planes.

Chemical developments in the natural-gas industry other than fuels are numerous. Many of the products are used to a large extent as starting materials for the preparation of still other chemical products. Synthetic rubber and rubber ingredients are probably the ones which are of most universal interest at this time. Synthetic rubber also constitutes one of the larger potential outlets for gas raw materials. The rapid growth of the synthetic-rubber activity is, of course, traceable to the needs of war. Basically, the synthetic-rubber industry is being built around the buna-type rubbers, using a synthetic latex prepared from styrene and butadiene. A number of other types of synthetic rubber, namely, neoprene, thiokol and butyl rubber, are likewise being manufactured but in lesser quantity.

Natural gas is also an important raw material in processes for the manufacture of high explosives. It is being cracked to produce hydrogen which is reacted with atmospheric nitrogen to produce ammonia. The ammonia is readily oxidized to nitric acid, which combines with toluene to form TNT. The reaction of ammonia with nitric acid yields ammonium nitrate, a base for explosives which is also a valuable fertilizer in peacetime.

Glycerine for the production of trinitroglycerine is another explosive raw material being made from natural gas.

Natural-gas hydrocarbons after conversion to the corresponding olefins can be used as the basic materials for a wide range of plastics. Innumerable plastics are required for the manufacture of war implements. Likewise, they are being used in nondefense applications as substitutes for strategic metals, rubber and silk vitally needed in armaments. Most conspicuous of their war applications is in the housing enclosing the combat stations of bombardier compartments in aircraft. Plastic washing-machine agitators, refrigerator-door panels, sealing frames and freezing-compartment doors are some of the many domestic uses of plastics.

A great amount of research is going forward in the field of natural gas as a chemical raw material. Undoubtedly, we can look forward to many more discoveries which will be of help in the present emergency and which will also fit into the scheme of things in the postwar world.

We have shown you many of the things which we in the natural-gas industry have to look forward to, both as to fuel uses, and as to the use of the extracted fractions as raw materials in the chemical synthesis of many varied and useful products. The road in the past has not been easy, and the future will not reveal itself advantageously unless we continue with our best efforts. The competition will be keen. Our greatest competitors as well as other organizations are planning their postwar economy.

Capacities of large power and fuel companies which have been increased during this emergency will make available a surplus of electric energy and a surplus of other energy which may be used for cooking, water heating, space heating, house heating, and industrial purposes. The competing fuel, which has most nearly solved the industrialist's operating problems during this war emergency is most apt to get the greater share of stored-up good will in the return to peacetime economy. In this regard, we believe the natural-gas industry has made rapid strides, but we must continue our efforts.

In conclusion, we believe that natural gas and its derivatives have a great and bountiful future. The reserves are plentiful for years to come. The many new developments of derivatives are permitting the natural-gas producers to obtain a market for the heavier fractions without appreciable effect on the amount of gas available for sale as a fuel. There are many new and improved uses of natural gas as a fuel already in the making; undoubtedly, more will be developed. The natural-gas industry should move forward with confidence.

Close control is essential in the recovery of butanes, propanes and pentanes from natural gas. Here an operator makes adjustments at one stage of the automatic control prevalent in all modern gasoline plants

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Representatives: Bethlehem Supply Co., *Tulsa, Houston, Los Angeles* Faville-Levally Corp., *Chicago*

DIFFICULTIES the Transmission Man Sees IN RELATION TO PAW AND WPB

by R. H. Ulrich *

Biggest problem faced by the natural-gas industry, this author asserts, is the material and supply situation. Herein, he outlines some of the more pertinent restrictions in Utilities Order 1, P-98-c, and points to some of the steps open to the industry to modify handicaps imposed by war's drain on critical materials.

IN discussing the subject, the field is open to perhaps as many thoughts and discussions as people talked to, with each individual, each location, and each case varying with the particular circumstances involved at the time. Obviously such a subject cannot be comprehensively and completely discussed in the time allotted especially since few have sufficient grasp of the many situations arising out of the regulatory orders as they are from time to time written. With this in mind, it is believed that a discussion of a few of the more important points not involving technical interpretations might be more practical.

Prior to our entering the war and the advent of PAW and WPB regulations providing for limitations on the purchase and use of materials, it was generally considered by many companies a prudent policy to make additions to inventories of certain materials and supplies in order to safeguard against shortages that seemed apparent in the future. It can be generally stated that many of the purchases made at that time, and later to be considered of an excess nature have contributed beneficially to the war program and will continue to do so, as long as they last. Had those companies not availed themselves of a reasonable supply of materials at the time, the period following entrance into the war when industries were converting and gearing their facilities to the making of war materials, many pipe-line companies, who previously had been getting their materials and supplies on relatively short purchase notice, may have by this time experienced difficulty in maintaining an adequate and uninterrupted service, not alone for public health and safety but in many instances to meet the greatly increased demands of industry, some of whom were the very manufacturers and vendors that purchases in normal time were made from, and who since had either converted or were converting their plants to war requirements.

In the beginning, because of lack of familiarity, difficulty was experienced by many as to the proper interpretation of the orders as written. Following what was considered a correct interpretation, the next step was to see that the information was passed along through the various channels of an organization so that all personnel could and would conduct themselves accordingly. At the outset this presented a most difficult phase in trying to arrive at compliance. In many instances certain kinds of materials could still be acquired from vendors without the use of priorities and some employes having authority to make purchases locally and having immediate use for materials would proceed to purchase their particular requirements as they had in the past. This condition has now, however, generally corrected itself, due to nearly all vendors requiring priority ratings and also because of the tightening of inventory values that a producer may maintain and disburse. Also in the beginning, purchasing department personnel experienced their troubles in trying to receive prompt and responsible commitments from vendors as to delivery dates. This has now been fairly well routined, due to experience and familiarity gained by both vendor and purchaser. As time went on, revisions in various regulations would occur, which would necessarily cause further reviews with subsequent changes within an organization in order to comply. One comment which the transmission operator cannot refrain from making in connection with the P-46 and U-1 orders is that they appear to have been written with a view to the situation and problems of retail distribution companies, particularly electric companies. This is said not in criticism but recognizing the extreme difficulty of writing general rules which must necessarily be applied in many divergent situations. It is the opinion and hope of many, that in future orders to be written, a simplified and more easily interpretable drafting be resorted to, which in turn, should assist in more prompt arriving at compliance.

U-1 More Workable

On February 24, this year, Preference Rating Order P-46 was superseded by Utilities Order 1. The U-1 order was in general similar to the P-46 order, but provisions governing inventories and use of materials were brought up-to-date and made somewhat more workable.

Under U-1, probably one of the greatest difficulties facing the pipeline transmission man will be in arriving at strict compliance with requirements f-(1), (2) and (3). Natural-gas systems in many cases are stretched over hundreds and sometimes thousands of miles of country, requiring many separate warehousing points for the maintaining of a supply service to both pipe lines and pumping stations. Both of these functions of transmission must, in order to maintain an adequate service, carry hundreds of inventory items with often a relatively small number being interchangeable from a utilization point. At the same time many of these items which are often urgently needed in an emergency, may be of a similar class as defined in U-1, so that the aggregate monetary total may appear extremely high from a minimum inventory standpoint. A natural-gas system may have many compressor stations widely separated by distances, whose installed equipment may not be identical with that of adjoining stations, or any other

*Vice president, Southern Natural Gas Co., Birmingham, Ala.

NO. 5 OF A SERIES
HOW TUBE-TURN WELDING FITTINGS BENEFIT WAR INDUSTRY
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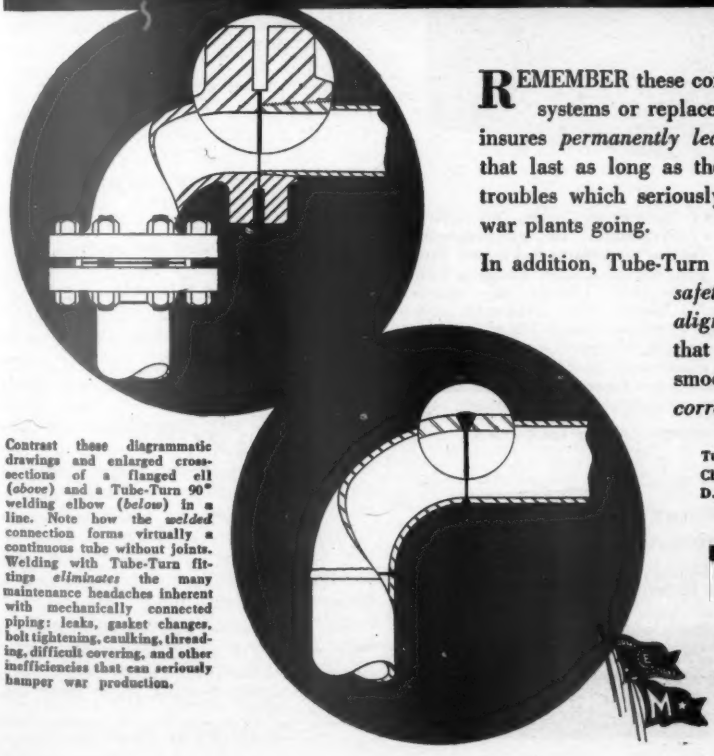

Contrast these diagrammatic drawings and enlarged cross-sections of a flanged ell (*above*) and a Tube-Turn 90° welding elbow (*below*) in a line. Note how the *welded* connection forms virtually a continuous tube without joints. Welding with Tube-Turn fittings *eliminates* the many maintenance headaches inherent with mechanically connected piping: leaks, gasket changes, bolt tightening, caulking, threading, difficult covering, and other inefficiencies that can seriously hamper war production.

REMEMBER these common-sense facts before you install new piping systems or replace old sections: welding with Tube-Turn fittings insures *permanently leakproof, trouble-free joints* and better fittings that last as long as the pipe itself. You banish many maintenance troubles which seriously interrupt the vital *piping arteries* that keep war plants going.

In addition, Tube-Turn welding fittings give you *greater strength and safety;* uniform wall thickness, for *easier, faster alignment and welding;* compact piping layouts that *save space, weight and installation time;* smooth inner walls that mean far *better flow, less corrosion* and *greater piping efficiency.*

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TRADE MARK
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station in the system, and with items of inventory being of the same class for the purposes of U-1; yet from a point of utilization not interchangeable. Here because of lack of similarity for utilization, the appearance would be that of an unnecessarily high minimum requirement. In the case of compressor stations and especially on a system where a high load factor prevails and standby units are not always available, it is most essential that complete inventories with an adequate number of items be kept for immediate use. Generally speaking, the matter of trying to mail, express, freight or truck compressor-station materials and supplies from central supply points for purposes of lower inventory, to a number of 24-hour operations which may be spaced from 40 to 100 miles or more apart is not satisfactory nor safe from a point of service.

Similar cases exist in districts or divisional sections of a transmission company's pipe-line department. There may be many district or division warehouses in a system having in inventory necessary repair parts and supplies, many of which will not be suitable for transferring to adjoining districts or divisions because of lack of interchangeability. Especially is this true of some of the older transmission companies where originally a uniformity may have existed but through years of replacements a diversification of materials in place has resulted. Here again the transmission man may find difficulty in carrying the minimum inventories that he should and would like to maintain. His inventory may have many items of the same class, though of different size, test, and manufacture, all necessary for maintaining an adequate service, but as a class under regulation, the needed working minimum may appear large

The new PAW Order, P-98-c, seems to definitely define what constitutes "surplus" materials and at the same time provides for a limiting of purchases and inventories. This new order, along with proposed "Material Redistribution Program 2," should permit a method of allocation of presently available materials.

Although ably discussed elsewhere, it might be proper briefly to mention the effect that the well-drilling restrictions in Petroleum Administrative Order 11 may have on a pipe-line company. Inasmuch as many transmission companies own and produce, either directly or indirectly, a part or all of the gas needed for their systems, it is conceivable that if the drilling of wells is too drastically limited, the supplies available for some systems may fall short. In other cases where transmission companies purchase their supplies in the field, producers may find themselves unable to meet demands made upon them, with the result that the transmission company may not be able to meet its market requirements. Also, there is the problem of how to deal with the owners of royalties and minerals, especially those having interests in proven areas and who are subjected to drainage. Presumably this order will be administered so as to permit the drilling of sufficient wells to produce needed gas supplies and also arrange some measure of protection to the owners of leases.

At this time it does not appear beneficial to try and recite additional problems that many individuals and companies say they have had under the orders issued by PAW and WPB. Depending upon individual circumstances possibly no two would agree whether P-98-b or U-1 was the more difficult to comply with. It is realized also that many may have been disappointed in requests and applications made for improvements and alterations that were considered of merit and necessary. But after all we must be realistic; we are involved in a war that at this moment has all the appearances of being long and deadly. Unless somewhat biased, I believe a majority would suggest that both of the federal agencies discussed here, handling the massive and complicated amount of work that they have been faced with, have done an excellent job.

(Continued on Page 81)

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WANTED: Experienced refinery superintendent for Cracking Plant and Topper located in Southern California. Reply, giving full details as to qualifications, P. O. Box 355, Santa Fe Springs, Cal.

INSPECTOR—Chemist for work with products pipe line. Experience necessary in general laboratory control of gasoline and heating oil testing. Furnish details concerning education, experience, brief personal history and salary expected. Include a small photo. Box B-591, The Oil and Gas Journal, Tulsa, Okla.

NOTICE TO ADVERTISERS

Advertisers offering positions to workers skilled in critical war industries are requested by the War Manpower Commission to include the following sentence in their advertisement:

"Applications from those now employed in war industries will not be considered."

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Well established Midwest Pump Manufacturer offers position of Chief Engineer to man experienced in the Design of Reciprocating and Centrifugal Pumps. This position is permanent and offers an experienced man the opportunity to become part of the management in a well financed Company, which is now on war work. Please answer giving complete experience, draft status, personal history, etc. All replies will be held confidential. Address Box B-593, The Oil and Gas Journal, Tulsa, Okla.

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FORMER Producer wants connection with opportunity. Age 41, Draft 3-A, Commercial Pilot with Army flying experience, want to stay in oil business—have plenty business contacts and experience. % M. N. Summers, R.R. #3, Jonesboro, Ark.

FIRE Protection Engineer with 13 years experience in Fire Prevention work, backed by actual war experience, training and directing firefighters during bombing raids, desires position with firm where ability and experience count. Age 33, White, Draft exempt. Box B-594, The Oil and Gas Journal, Tulsa, Okla.

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GRADUATE ENGINEER can design, construct and operate a first class casinghead gasoline plant or oil refinery. Many years experience including major companies. Box B-606, The Oil and Gas Journal, Tulsa, Okla.

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(Continued on Next Page)

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5½", 16" Cooper, 7" I-R to fit Cooper, 7¼ I-R, 6¾, 7⅛, 7⅜, 7½ Type 10 Bessemer, 12" Miller Reshopped Compressor Cylinders. 210-24 Southwestern Heat Exchanger. 8' x 40' Low Pressure Gas Testing Tower. 49' x 12' Reflux Tower. 9' x 4½' Graver Water Filter, 6' x 7' Graver Water Softeners. 6" x 5" Centrifugal Pumps, 1" Centrifugal Pump. 4 x 6 Fairbanks Morse Duplex Power Pump.

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Viscosity, Say. Univ. @ 100° F.	4,000 Sec.	Sulfur (ASTM D 129-39)	0.33%"
Viscosity, Say. Univ. @ 210° F.	172 Sec.		
Viscosity Index (ASTM D 567-41T)	77.1		

Written bids stating the citizenship of the bidders shall be submitted to the Division of Liquidation, Office of Alien Property Custodian, 1114 Liberty Bank Building, Dallas, Texas, on or before May 15, 1943, and will be publicly opened at said address on May 17, 1943.

All statements of citizenship shall be deemed to be representations of inducement to the Custodian and all bids shall be deemed cash offers and shall be irrevocable for ten days after the date set for the opening of bids. The Alien Property Custodian reserves the right to reject any and all bids submitted.

Information regarding the above-described oil and terms of its sale may be obtained by writing the undersigned at the above address. The oil may be inspected by appointment at the warehouse.

LEO T. CROWLEY

Alien Property Custodian

The real problem for future thought, however, is the material and supply situation. Those difficulties that we have had in the past, or even those that are immediately being dealt with, may be mild compared with those that are ahead, in 1, year, 2 years, or as long as the war continues. Naturally, the Army, Navy and Merchant Marine requirements must be met first, and on schedule, and their needs for materials in critical categories must be fulfilled. As the war continues, it is highly possible that even more acute shortages will develop in certain types of materials now used in construction, maintenance, and repair, such as certain high-grade steels for forgings, steel castings, bronze and babbitt for bearings (the latter with its high percentage of tin), copper for cables, wire, motors, tubing and other critical materials needed for the repair and maintenance of heat exchangers, pumps, meters, generating equipment, and other items.

Disregarding past problems except as a means of enlightenment and experience for meeting those of the future, the conservation and total use of the materials available or those which may be acquired in the future should be of first concern whether they be of a so-called critical class or not.

Those who have machine-shop facilities of their own have a distinct opportunity for conserving materials. And for those not so equipped, there are still probably some competent concerns with shop and foundry equipment that will be glad to do repair and reclamation work. Many materials after original and secondary uses can be turned down or built up. Rotating and reciprocating shafts can be metallized and finished, and simplification, substitution, and adaptation of materials and equipment that are available and readily obtainable can be practiced, in order that a system be not appreciably handicapped. Many specialized tools and equipment which heretofore have been considered essential can be replaced by equipment and materials of noncritical nature. There are available today many obtainable commercial items, which can be adapted and used in place of specially designed equipment, which is difficult to procure or obtain repair parts for.

Another thought is that of appointing a salvage engineer or possibly a salvage committee within an organization, preferably men who have some metallurgical as well as practical experience, to pass on all materials considered to be beyond further use before being scheduled for scrap sale. Such a man or committee may promote new ideas and ways of reusing materials once thought to have no value, and in addition may more quickly determine whether there are possibilities of reuse so that if no benefits can be realized, such materials may then promptly find their way into the country's scrap and salvage program.

It is recognized, of course, that in the past a number of transmission companies have been doing things of this nature, but a greater effect of such conservation will be felt when others do so.

In concluding, it has in the past been a general impression of other nations throughout the world that the American people are inherently wasteful. Maybe this has been somewhat true, but now we find ourselves in a position that compels us to observe and practice a strict economy. I am certain that every transmission man will look ahead toward the elimination of wasteful practices, whatsoever and wherever they may be and by conscientious and diligent application to conservation and resourcefulness, problems with relation to PAW and WPB can be reduced, thereby allowing those agencies more opportunity in which to apply their time and effort to the needs of the armed forces. By exercising the ingenuity and resourcefulness that we are supposed to possess, many future problems may be avoided, and in so assisting these agencies of the federal Government, we in turn are doing our part in helping toward the winning of this war.

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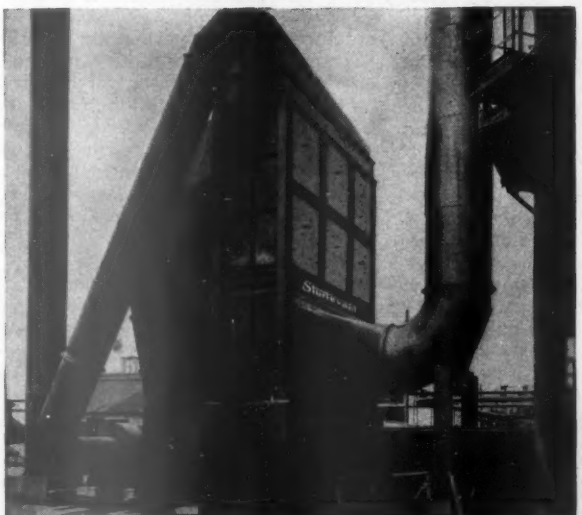

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Relationship of the Petroleum Administration for War to The Natural-Gas Industry

by E. Holley Poe

E. Holley Poe, the author, was formerly secretary of the Natural Gas Section, American Gas Association, and is now director of the Natural Gas and Natural Gasoline Division of the PAW

FOR 5 years — from 1937 until 1942—I was privileged to serve the American Gas Association. In the months that have elapsed since I was drafted for work in wartime Washington, I have reported to you frequently on various phases of the government program for your industry, and it is a pleasure to report to you more fully now.

The Natural Gas and Natural Gasoline Division of the Petroleum Administration for War (then the Office of the Petroleum Coordinator for War) was established in May 1942, in recognition of the increasing importance of your industry in basic wartime operations. That the duties and responsibilities of the division have been permitted to expand immeasurably in the ensuing months is evidence enough of the degree of success which has been attained in our mutual attack on wartime natural-gas problems.

Progress Made Despite Problems

Those problems have increased in number and complexity since the outbreak of war. Our task has not been an easy one this first 16 months. It is the more surprising, then, that we have not only succeeded in holding our own—we have forged ahead to a key position in the nation's business-in-wartime picture. Your ability to produce and deliver gas has an increasingly important bearing on the nation's over-all ability to deliver vital petroleum products to the fighting forces outside the continental United States. If you were forced into the back seat, in so far as exports were concerned, you have at least exercised the better-half's prerogative—you are doing a fine job of back-seat driving. Fortunately, there is but one goal forward which we care to drive.

There is no 35-mile limit on winning the war, and we have passed swiftly by mileposts set up by the natural-gas industry: the conversion of the Stanpac line between Kettleman Hills and San Francisco; a similar conversion of the 150-mile United Gas line between Refugio and Houston, Tex.; utilization of existing facilities in gas fields and in the construction of pipe lines, the latter to the extent that one-third of the total line laid in 1942 was picked up, reconditioned, and relocated; the unselfish pooling of dwindling power, material, and manpower resources; the concerted drive toward effecting maximum deliverability with minimum expenditure of critical materials; the release of materials in overexploited or prematurely exploited areas for use in other areas within or beyond the district; the establishment of large storage reservoirs in the Los Angeles Basin and elsewhere; the effort to relieve the critical District 1 situation, with two-thirds of the gas-line mileage laid in 1942 having that as its goal; the efforts toward conservation; the expanded program for utilizing natural-gas and natural-gasoline constituents and byproducts in the 100-octane program, the explosives program, and the synthetic-rubber program.

These are some of your most important achievements. We in the Natural Gas and Natural Gasoline Division of the Petroleum Administration for War have, we hope, assisted in coordinating your efforts. We make no further claim, for these achievements are primarily the result of splendid cooperative industrial action. We prefer to believe that we are the most facile unit in the group, for we are but the cord that binds together the oaken rods, thus strengthening the individual members.

We administer on behalf of the PAW certain orders which affect the production operations of your industry and the natural-gasoline industry. The most important of these is Petroleum Administrative Order 11, which replaced Conservation Order M-68. PAO 11 provides a control over your use of critical materials for well drilling or production operations. It is, further, a means of assuring that your use of critical materials will make a maximum contribution to the war program in terms of gas or other hydrocarbons produced.

Drilling Restrictions Tightened

Under the terms of PAO 11 the use of material to drill gas wells in proven areas or condensate wells is prohibited unless a specific exception is obtained. Blanket permission to drill gas wells on 640-acre units is no longer available. The reason for this apparently severe restriction is simple. Transmission line capacity obviously serves as a brake upon gas production and gas-well drilling. No more wells should be drilled than are needed to serve demands of existing pipe lines.

In the greater part of the continental United States we already have sufficient gas wells to meet these demands. New wells should be drilled only in response to new demands for which adequate pipe-line capacity exists. To illustrate this principle, let us refer to the Hugoton and Panhandle gas fields. Deliverability with present production facilities is limited only by transportation facilities. It is natural, then, that PAO 11 should continue those prohibitions which were imposed in Petroleum Administrative Orders 6 and 9.

On the other hand, there are certain areas where, for numerous reasons, including rapidly declining reserves, gas-well drilling must be encouraged and made possible readily.

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. . . *but it isn't dehydration service.* However, he and his new buddies are experts at treating . . . treating the Axis rough.

Bill, representing the Dehydro Engineers now in the armed forces, still has his old fellow workers here in the oil country. They're pulling for him, and "carrying on." They're all set to keep that Dehydro Service right up to par . . . and not "let any Dehydro customers down."

At the same time, we must all bear in mind that although service must be adequate, it cannot be *as usual.* "Service as usual" burns up rubber needed in the war effort, uses precious time that must serve the entire industry. Your cooperation in requests for service will be of great value — to your industry, and in the long run to yourself. Before you ask for service from any of the companies servicing your needs and those of the oil industry at large, *think.* They're all glad to help when it's necessary, but they'll appreciate your cooperation in eliminating unnecessary calls.

When you *need* dehydration service . . . call your Dehydro Engineer.

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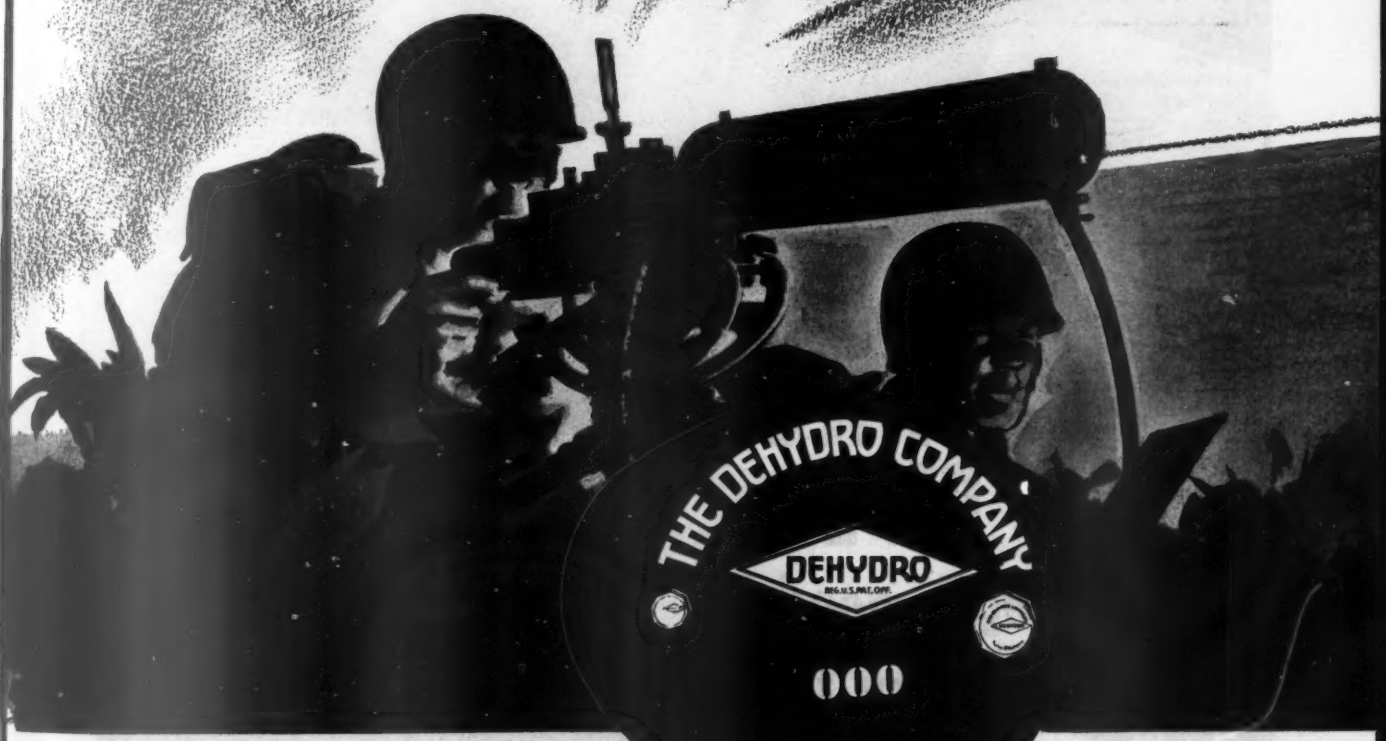

Dehydro Engineers in green cars are located in: Great Bend, Hutchinson and Hays, Kansas—Wewoka, Nowata, Duncan, Wilson, Oklahoma City and Tulsa, Oklahoma—Kilgore and Wichita Falls, Texas—Tullos and Monroe, Louisiana—Hobbs, New Mexico—Bridgeport, Albion and Mt. Vernon, Illinois.

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The fields of the Appalachian region, eastern Kansas, northeastern Oklahoma, and Missouri are examples in this category. To meet the problems presented in these areas, Supplementary Order 1 to PAO 11 was issued. This supplementary order in effect authorizes a blanket exception covering gas-well drilling in these areas, providing the wells can be drilled in conformance with certain standards and spacing patterns set forth therein. These standards have been adopted in an effort to assure that a maximum production of the desired hydrocarbons will be obtained with a minimum expenditure of critical materials.

Under the terms of PAO 11 the use of material for the drilling of condensate wells and for the construction and expansion of natural-gasoline plants is prohibited without specific authorization. Again, the reason for this restriction is simple. The condensate fields of this country represent a vast new source of petroleum hydrocarbons. Technologically, they require a planned and orderly development to avoid dissipation of liquid or gaseous hydrocarbons in the reservoir. The prohibition against free and unencumbered authorizations will not be issued. We are willing and anxious to receive and approve sound, overall plans which call for proper, orderly development of these resources.

Plant Construction Guided

Natural-gasoline plant construction and expansion is a necessary adjunct of our expanding aviation-gasoline and natural-gas supply programs, but we must be certain that the use of material for such purposes will make a maximum contribution to the war program. Accordingly, by restricting the use of material for these purposes, we have been, and we shall continue to be, able to guide material usage in this industry toward a close and intimate association with the vital 100-octane program.

In the administration of PAO 11 the Natural Gas and Natural Gasoline Division is ready and willing to recommend the issuance of specific supplementary orders designed to meet particular local conditions wherever operators can present compelling factual data in support of their requests. We like to have the recommendations come through our industry committees.

In addition to administering PAO 11, this division assists the Materials Division of the PAW in the administration of Preference Rating Order P-98b. This order is designed to extend priorities or preference rating assistance to operators engaged in the production of natural gas and natural gasoline. It is the means whereby these operators may obtain their just share of the limited quantities of critical materials available. Basically, we ask one question with respect to all activities under this order: Does the projected use of material aid the war program directly? If the answer to this question is in the affirmative, we will do anything necessary to assist an operator in obtaining materials; if the answer is in the negative, it is obvious, with the critical shortage of materials which exists today, that no such assistance can be given.

The Natural Gas and Natural Gasoline Division also processes, on behalf of the War Production Board, all other applications for priorities or preference-rating assistance which may be filed by operators engaged in the production of natural gas and natural gasoline. In this connection we review and process PD-200, PD-1a, and CMP-4c applications, as well as other documents of a similar character. The standards which guide us in processing this type of application are the same prevailing in the administration of Preference Rating Order P-98b.

We are further privileged to serve as consultants to the WPB's Office of War Utilities in connection with the consideration of applications to construct or extend natural-gas pipe-line facilities. While the actual processing

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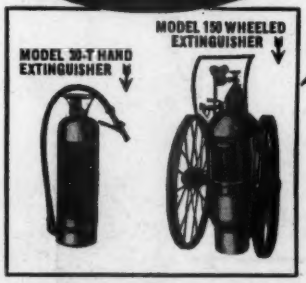

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of such applications rests with the Office of War Utilities, that agency maintains the closest and most effective contact with us in considering the problems involved. They have afforded us every opportunity to express our views with respect to any particular proposal—an opportunity for which we are sincerely grateful.

The Natural Gas and Natural Gasoline Division of the PAW likewise serves the WPB's Liquefied Petroleum Gas Section in a consulting capacity in the administration of Limitation Order L-86, which prohibits the installation of new or additional L.P.G. utilization equipment without specific authorization.

Within the framework of the orders and activities mentioned above the division is attempting to discharge its basic responsibility; namely, that with a minimum use of the scarce materials needed for the manufacture of the implements of war, there shall be made available at the proper time, in the proper places, and in sufficiency, natural gas and associated hydrocarbons. These considerations are vital in carrying out a successful war program.

By considering at greater length present conditions in the Appalachian region (District 1), and eastern Kansas, northeastern Oklahoma, and Missouri (District 2), we may see more clearly just what conditions prompted issuance of a blanket exception for these areas. Such a consideration will highlight the gravity of the situation in Districts 1 and 2, and thus the reason for our devotion to the major war problem presented.

In District 1 the most serious situation exists from the standpoint of supply. Not so long ago I quoted reserves and consumption in this district to you as being, respectively, 6 and 18 per cent of the nation's total. With the discovery of large new reserves in the Southwest and very little to supplement the waning 5 trillion cubic feet in the Appalachian region, reserves in District 1 have dropped to 5 per cent of the total. Consumption has increased substantially and may be expected to increase further.

Causes of Material Shortage

As more of our fighting forces move overseas, more and still more petroleum products must move with them and after them. A recent report stated that as much as two-thirds of the tonnage in an advancing unit may be devoted to petroleum products. These petroleum products must be released for shipment to the armed forces. Obviously the most practical method is to transport them overland to East Coast ports having the shortest possible tanker haul to military posts in England and North Africa. Recently released figures on ship losses vividly bring out the grim necessity of this strategy. Remember, then, that oil must often have priority on inland transportation systems, which require enormous quantities of critical materials. You will be pleased to hear that priority so granted has permitted movement overseas this first year of World War II, 80 times as much in petroleum products as was transported the first year of World War I—think of it—that is an increase of 8,000 per cent! We in the Natural Gas and Natural Gasoline Division of the PAW have necessarily resorted to a highly specialized attack on the problem, involving intensive drilling within those regions of critical deficiency. The yield thus obtained will, we believe, to a large degree, supplement current deliverability most rapidly and with the minimum use of scarce materials. And it will keep those petroleum products moving overseas rapidly.

This intensified drilling program—calling for about 2,500 gas wells in District 1, or four-fifths of the proposed total in the United States for 1943—must be vigorously pursued. Peak-day demands in this district may well exceed 2½ billion cubic feet. Uninterrupted delivery must be continued to war industries whose needs in the nation now are estimated at 25 per cent of the total;

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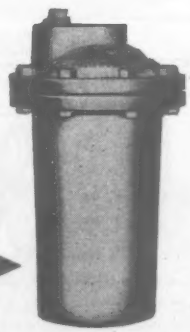

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NOW—we have been called upon to build over 100 miles of 20" line in Missouri and Arkansas for War Emergencies Pipelines, Inc. In addition to this we are building 12" and 18" lines for the United Gas Company . . . and 8" lines for the Champlin Oil Company. We are happy that we could expand our facilities to meet the needs of both our country and our customers. B & M CONSTRUCTION CORPORATION, Oklahoma City, Okla.

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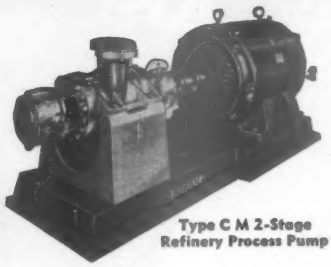
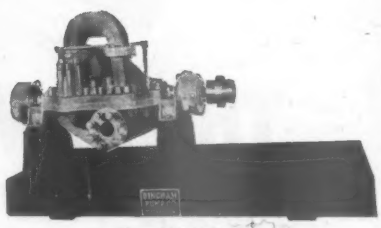
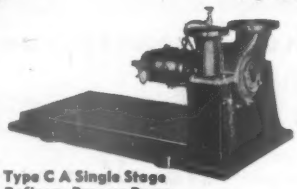


Type C M 2-Stage Refinery Process Pump

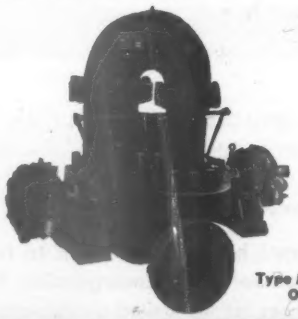


Type M S M Multistage High Pressure Pump



Type C A Single Stage Refinery Process Pump

Type C S B Multistage Stuffingboxless Pump



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Some day you will have a tough pump problem. When you do, write, wire or phone your nearest Bingham sales office or communicate with us direct.

We will gladly give you the name and location of an oil refinery in your territory where Bingham pumps are installed. Then judge for yourself the job Bingham pumps are doing under actual field conditions—and how they will perform for you.

the figure for industries directly and indirectly related to wartime production will probably run as high as 50 per cent.

We cannot yet rely upon importation of large additional quantities of gas from any other district. Deliverability cannot be supplemented appreciably by District 2, as that district is itself suffering peak-day shortages. Reserves therein are estimated at 17 trillion cubic feet, but 15½ trillion of that total lies in the tremendous Hugoton field, as yet available only to the limit of existing transmission facilities.

Construction of a major line from this field now appears probable. However, with daily deliverability ranging from 140 million cubic feet to 250 million, it will necessarily be utilized in meeting requirements within the district. Especially will this hold true in light of the anticipated drastic curtailment of gas production from the Cement field of Oklahoma (with the district's second largest reserves), where oil has been found apparently associated with the gas in the field's principal reservoir.

District 3 Imports Studied

Importation from District 3 is under consideration with hearings now being conducted before the Federal Power Commission on a project approved by the PAW and the WPB. This would make available to the East 50-100 million cubic feet of gas per day to be drawn principally from the Panhandle field and transported by the Panhandle northeast line. Interconnections would be provided to Ohio properties, where the gas could be stored during the summer and made available to meet winter peak-day demands.

District 3 must be looked to ultimately to supply, or at least supplement very appreciably, the reserves in District 1. In 1943 gas was exported into every other district from its huge reserves, estimated by industry committees to be in excess of 60 trillion cubic feet—nearly 65 per cent of the nation's total. To draw a single comparison, this reserve is the equal in energy of Boulder Dam's output* for the next 1,150 years.

Over half of District 2's 1942 consumption was imported from District 3, 1943 demands will run still higher, and one third of the district's production, which will exceed 1 trillion cubic feet, will again be exported to District 2. District 3's production, it is interesting to note, was over one-third of the nation's total last year.

That production figure for 1 year is the equivalent of District 4's total reserves. However, production within the district is sufficient to meet present demands with importation of some gas along presently available lines from the Texas Panhandle.

*On the basis of 1943 estimated output.

District 5 poses yet another problem. Some gas was imported from District 3 to meet demands in Arizona. But California, the only state in the district with appreciable production and reserves, and with the largest number of consumers of any state, was able to supply its demands, despite serious peak-day demands. The district has a reserve variously estimated from 9½ to 12½ trillion cubic feet, with last year's production about 3 per cent of the higher figure. However, since a substantial proportion of District 5's reserve is gas in association with oil, to be produced over the flowing life of the oil fields, peak-day deliverability was extremely critical this last winter. It will be so next winter unless we can discover additional important dry-gas fields. This is especially true in northern California, which is no longer served by the 26-in. Stanpac line since its conversion to oil transportation. This conversion darkens the supply picture slightly, but some relief has been afforded by rearrangement of facilities and extensions to bring additional gas to the San Francisco area from the Rio Vista field. In this district, as in Districts 1 and 2, depleted fields adjacent to centers of distribution are being utilized for storage against peak-day demands, the Playa del Rey field having most

Tomorrow's oil field equipment will be even more rugged and efficient—thanks to wider use of VELVETOUCH clutches and brakes. Today, while most of the output of this remarkable friction material is going into the war effort, engineers in a hundred drafting rooms are designing post-war draw works, pumping units, portable drilling rigs, sideboom pipe handling equipment and ditchers that will do more work at lower cost. In all brake and clutch applications they will utilize the many superior qualities of VELVETOUCH which give you assurance of smooth, positive, trouble-free operation.

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recently been made available for this purpose.

This, then, is our stock-in-trade—an estimated total of some 90-95 trillion cubic feet of gas, the equivalent in heating power of approximately 18 billion barrels of oil, 3¾ billion tons of coal, or 6¾ trillion kilowatt-hours of electricity.

What, then, of the manpower with which we must move this huge stock?

By the end of 1943, it is possible that the controlling factor of war production will no longer be facilities or materials, but rather manpower. The continued withdrawal of men by the Selective Service and the additional labor requirements of expanding war industries will certainly result in drastic depletion of working forces throughout the petroleum industry in the near future.

The manpower problem in the natural-gas end will stem largely from withdrawal of men between the ages of 18 and 37 by the Selective Service. In 1944 our armed forces will total 11 million men. There are only 22 million men in the military age category between 18 and 37 years of age; of these, only 14 millions are estimated to be physically qualified for military service. Thus the total number of men who will be deferred from military service on grounds of dependency or occupation is only about 3 million. Of these, approximately 1½ million will be in industry, with a like number in agriculture.

Up to this time, most men in industry have been deferred because of dependents, with relatively few deferred by reason of occupation. Married men without children are now being taken into the armed forces, and the drafting of fathers is expected to start in a few months. Deferment on grounds of dependency is rapidly dropping out of the picture, and occupation will henceforth be the controlling criterion.

In light of the figures mentioned above, let us now forecast the impact of the draft on the natural-gas industry. It is probable that the vast majority of men between the ages of 18 and 37, perhaps as many as 85 per cent, will be called from the industry this coming year. Few of the men will fail to pass the Army physical, because examinations given them in the natural-gas industry are in many cases more rigid.

Manpower Twofold Problem

These startling figures on the withdrawal of workers pose a twofold problem for the natural-gas industry. First, measures must be taken to secure the deferment of key employes and necessary men without whom operations cannot adequately be maintained. Second, measures must be taken to replace systematically and in orderly fashion those men for whom it will prove impossible to secure deferment. This calls for recruiting women, physically handicapped workers, and older men. It calls for intensification and streamlining of training programs for new workers. It calls for upgrading of more competent workers into supervisory ranks. In short, the manpower problem with which we are now faced puts us to a supreme test. But companies with aggressive, farsighted management are finding ways and means of meeting this test.

The PAW is now taking an active part in advising employers concerning the best methods for handling manpower problems, as well as the proper procedures for dealing with the War Manpower Commission and the Selective Service System. The job, however, can and must be done by management itself. Success will be dependent upon your competence in tackling, along with your many other responsibilities, this ever-pressing problem.

As a start in meeting the manpower situation, we urge all employers in the natural-gas industry to prepare and file "replacement schedules" with the state directors of the Selective Service System. On these replacement schedules, the employer lists his personnel by job classifications and by

To SAVE STEEL USE GRIZZLY ROTARY BLOCKS ON ALL TYPES of DRAWWORKS

*Grizzly Blocks are made to exact manufacturers specifications for all types of drawworks — CARDWELL — EMSCO— FRANKS — NATIONAL (IDEAL) — OILWELL—WILSON—and all other makes. Be *sure* to try Grizzly Blocks on *your* equipment. You'll get better results, longer brake and rim life, *and save steel.*.

Brakes that grab and howl are a sure sign the brake material is cutting or wearing away the brake rims *faster than necessary*. Now that rims are almost impossible to obtain, give them maximum protection by using Grizzly Rotary Brake Blocks.

Grizzly Blocks contain no metal of any kind —positive assurance they are easier on brake drums. They are compressed under 1,000 tons of hydraulic pressure in *new* presses, with absolute control of radius *when curing* in precision controlled ovens, insuring perfect contact of braking surface on rims.

Grizzly's smoother action, easier feed-off and non-smoking or dusting performance, all insure less wear on brake rims and maximum conservation of vital steel—a guarantee of longer life to both rims and lining.

For better results on your brake equipment, *regardless of make*, use Grizzly Blocks. They'll do a better job and help you save steel. Try them and compare their performance and length of service.

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Export Office: Continental Emsco Co. 30 Rockefeller Plaza, New York, N. Y.
Complete stocks Maintained In Our Warehouses at Houston, Texas; Oklahoma City, Okla.; Casper Wyoming.
Distributed By Leading Supply Companies.

FIRING AWAY

More production is the order of the day. Men and machines work on, while guns, tanks, ships, planes, ammunition become the tools of war. This is a vital part of our Nation's program for Victory. It enables our armed forces to thunder their powerful message to the enemy on the world's fighting fronts. Behind this mighty task, providing boundless, unfailing energy for our industries, are Natural Gas and Electricity—master servants which perform their appointed wartime duties silently, effectively, continuously . .

★
1500

Yes, Columbia System is enlisted for the duration. Already 1500 of its employees have relinquished varied peacetime duties to join the colors.

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draft status. He indicates the workers of draft age who can be released in less than 6 months and also designates key workers who must be deferred for 6 months or more. The replacement schedule is in effect a plan for deferment of key workers and release of lesser-skilled employes, requiring approval by state headquarters of the Selective Service. If approval is granted, an "acceptance number" is given the employer for use on all requests to local boards for deferment of key workers. This stamp, of course, will generally insure deferment by the state director if not by the local board.

Within a short time, the PAW will issue instructions to the natural-gas industry on the preparation and filing of these replacement schedules. This program has already been started in refineries and will be extended to other branches of the petroleum industry as rapidly as possible. In the meantime, however, advise your personnel manager to get in touch with the Selective Service System and the War Manpower Commission in order to study the ramifications of the replacement-schedule plan.

PAW district offices will soon be prepared to assist you on problems of manpower. The district natural-gas and gasoline-industry committees are also concerning themselves with these problems. Contacts will be made on behalf of the industry with the various regional, local, and state representatives of the War Manpower Commission and the Selective Service System, to the end that you will be kept abreast of the latest developments and the proper procedures for dealing with manpower agencies of the Government.

May I make it doubly impressive that manpower problems are essentially regional and local and, as such, must be settled regionally and locally by the employer, with whatever assistance our PAW district offices may be able to give. Manpower cannot and will not be handled in Washington. It is a job which must be tackled and solved by management.

Your actions since the outbreak of war have indicated your awareness of your responsibility in this period of national crisis. In closing, I may only emphasize, with all the force that I can muster, that we must not diminish our determination and enthusiasm for completing this uneconomic, unpleasant, and altogether undesirable war job.

Risks Still Attach to Gas Lines

by Paul B. Coffman*

THE natural-gas industry, as a result of the development of long distance pipe lines, has, figuratively speaking, gone "big time."

Unfortunately, principal sources of natural-gas supply are not in too many instances proximate to the centers of demand. The places to be served and the quantities to be furnished, therefore, are largely determined by the capacity of the pipe lines and the direction of their rights-of-way. It is most fortunate that our country has as many pipe lines as are in existence. For this, all thanks should go to the men in the industry, and to the investors, who were willing to take the risks involved in financing their construction. Today of course, those risks might be termed "old stuff" by various members of the regulatory bodies, since some of them seem to feel there is little hazard attaching to this industry. However, in 1926, when long distance pipe lines were first being constructed, investors and operators alike believed the industry was very hazardous and they know from experience that risks still attach to it.

I have made an elaborate analysis of how investors classify the various branches of the utility industry. For lack of a better title, I have called it the "Investor's Appraisal of the Over-all Risks of Capital in the Public Utility Industry." This shows, as portrayed in the accompanying Chart 1, that the investor believes the risk increases in the following order: Telephone companies, water companies, electric operating companies, manufactured and mixed-gas companies, all natural-gas companies and natural-gas pipe-line companies. Actually, the composite 5-year average earnings price ratios for the companies in each of the above divisions are as follows: 5, 5.34, 5.51, 6.74, 7.77 and 9.03 per cent. In other words, in the opinion of the investor, a natural-gas pipe-line company faces substantially more hazard than a telephone company, which is measured by an additional 4.03 per cent of return demanded by the investor on his money. Moreover, he believes that natural-gas pipe lines are considerably more hazardous than the other main branches of the utility industry, as indicated by the above figures.

*Vice president, Standard & Poor's Corp., New York.

Limit on Earnings

This matter of applying a standing 6½ per cent rate of return to the lowest rate base that can be established makes a great deal of difference in return so far as investors are concerned. I have selected at random eight companies to make a comparison, as shown in the accompanying chart. I have assumed that their net property and working capital, as shown on the books, represents their invested capital, and I have applied a 6½ per cent rate against such figure. Admittedly this is not an accurate comparison, for the rate base, as determined by the Federal Power Commission, would no doubt be different, but it will serve to illustrate that such application produces wide variations in return as between the companies. In so far as such figures are in error, they err on the conservative side.

The factors I have discussed cover, in a general way, the more important developments during the war period. Very few new lines are being built or additions being made because of shortages of critical materials and the limitations of their use, yet more gas is going through the lines than ever before. Yet while it was doing this it has been subjected more and more to severe regulation and greater and greater rate reductions so that it can further honestly be stated that its contribution to the war effort has come in spite of the Government rather than through any assistance from it.

In the postwar period, I do not look for any severe reaction such as we experienced in 1920 and 1921, nor a depression such as we experienced in 1930, 1931 and 1932. No doubt there will be a readjustment, which subsequently will be described as a recession, when we make the transition from a wartime to a peacetime economy.

If the industrial activity which I have forecast materializes, there will be a tremendous demand for gas. This will lead to the construction of many new pipe lines.

Of course, it will not always be clear sailing for the natural-gas industry because the shift from a war

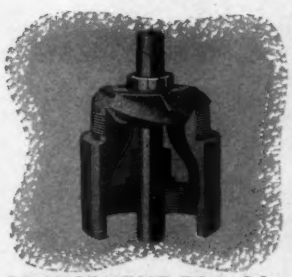
NEVER BEFORE HAS POWER CONSERVATION BEEN SO IMPORTANT

Never before have Pomona advantages been so vital!

Pomona Pumps are singularly able to cut power requirements to a minimum because they embody basic engineering advantages found in no other pumps . . .

BULBOUS VANED BOWLS! This outstanding Pomona Pump development has lifted the already high Pomona efficiencies to a new peak . . . *in some cases above* 90% . . . reducing power requirements to a record low. The bulbous end shape smooths out fluid flow, minimizing turbulence, eddy currents and resultant skin friction. Result — more power goes into actual water pumping!

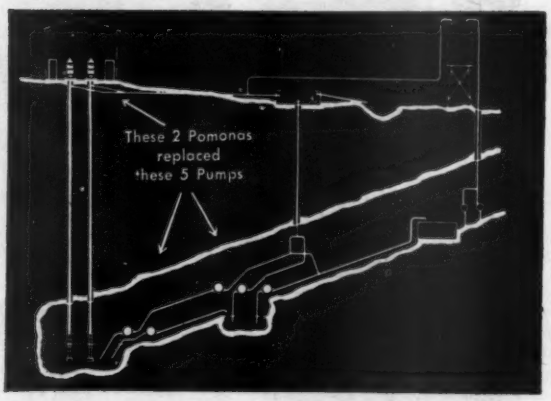
Bulbous vaned bowls are a recent Pomona advancement, and older Pomona Pumps can be re-bowled with this power-conserving feature. However, to save metals, get as much service as possible from your present bowl assemblies before having them changed for the new bulbous-vaned type!



ADJUSTMENT FOR CAPACITY! Here's another vital power-conserving feature that no other pump provides—ability to adjust the capacity to your exact needs *without wasteful throttling.* Unlike conventional pump impellers, Pomona's semi-open impellers can be raised or lowered on their seats to give the exact flow desired, *with proportionate savings in power.* And this adjustment can be quickly made *at the surface* with minimum effort. Raising the impeller gives more clearance between blades and seat—pumping less water and, at the same time, reducing the operating power required.

RESULT—power consumption is proportionate to amount of water pumped.

Contrast this with the valve-throttling necessary in other ... pumps to adjust pump flow. Throttling increases the pressure the pump must work against—*increases* the power required in proportion to flow.



ONE POMONA CAN REPLACE SEVERAL PUMPS— Often a single Pomona Pump will do the job now requiring *several* other-type pumps . . . will do it *better,* with considerably *less* power. Typical is the Pomona installation diagrammed above where two Pomonas replaced FIVE horizontal pumps on a dewatering job. The Pomonas not only eliminated excessive piping and power cables, but did the job on 400 h.p., whereas the 5 pump arrangement had required 675 h.p.—*67% more!* Compare the power costs—$19,936 per year with the five-pump set-up . . . $10,750 per year—about HALF—with the Pomonas!

Call in your nearest Pomona representative and have him check over your pumping installation. Perhaps he can help you take fuller advantage of the *many* — and varied — savings incorporated in Pomona Pumps. You'll save power, save money, save maintenance . . . *and save resources vital to our war production!*

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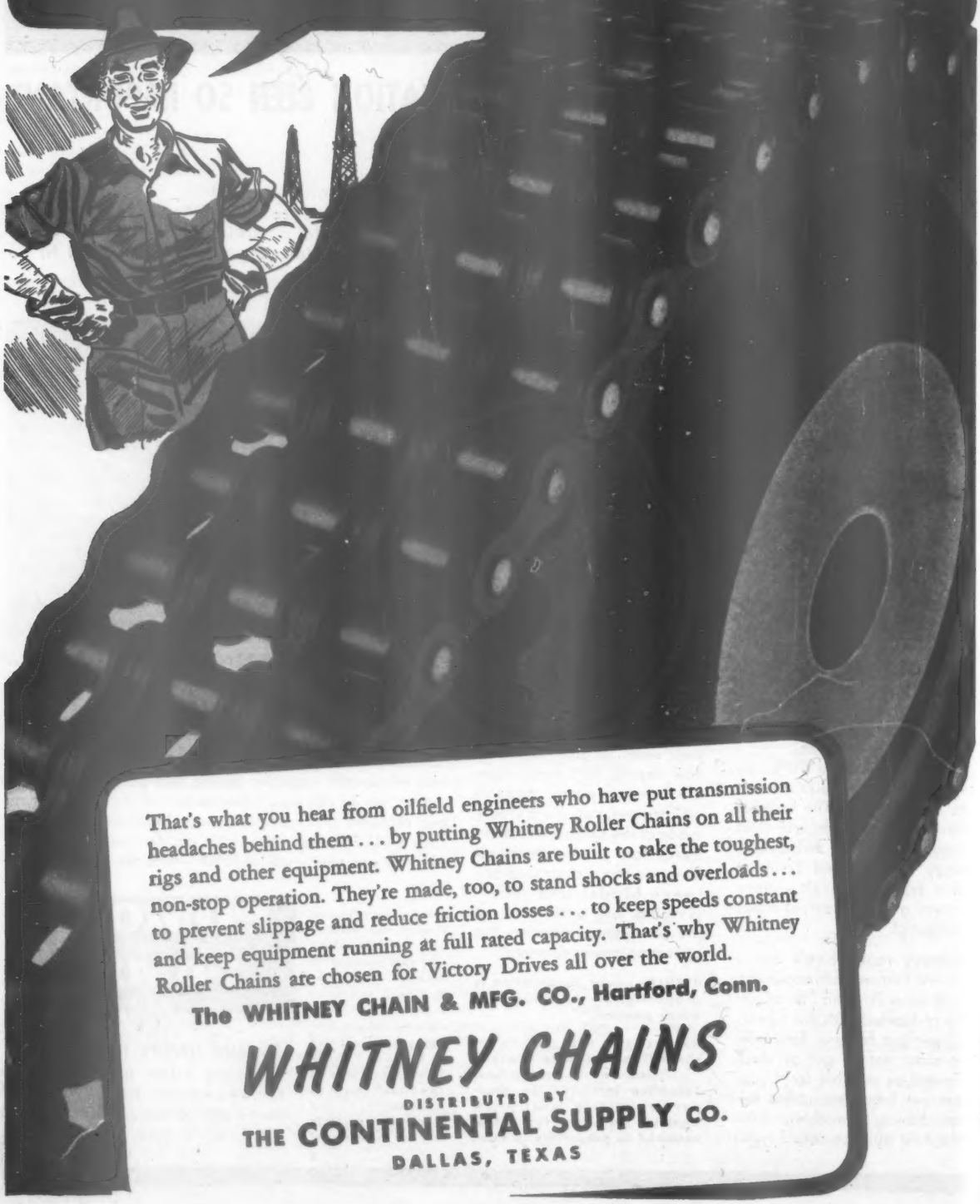
...BUT POWER TRANSMISSION ISN'T ONE OF THEM



That's what you hear from oilfield engineers who have put transmission headaches behind them . . . by putting Whitney Roller Chains on all their rigs and other equipment. Whitney Chains are built to take the toughest, non-stop operation. They're made, too, to stand shocks and overloads . . . to prevent slippage and reduce friction losses . . . to keep speeds constant and keep equipment running at full rated capacity. That's why Whitney Roller Chains are chosen for Victory Drives all over the world.

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to peacetime economy will involve a number of adjustments. These will probably stem from four principal causes: (1) The change in uses of gas when the present restrictions on domestic consumption are lifted; (2) the increase in demand which will spring from the increased postwar industrial activity created by the great reconstruction and rehabilitation program; (3) the development of new uses for gas, especially in connection with a thorough study of hydrocarbons and the chemical possibilities hidden therein, and (4) the stepped-up competition which will immediately begin when hostilities end and the demand for armaments is gone.

Supply Chronic Problem

There will be the chronic problem, namely, the adequacy of the supply of gas. It has been estimated that at the present rate of output proven reserves of natural gas will be exhausted in a period of from 27 to 30 years. Yet experience teaches us that new reserves are being found from time to time to enlarge our stores, and new methods of making the most of our known reserves, such as, deep drilling, recycling, repressuring, storage, etc., are being developed.

So far as regulation is concerned, it will be with us, but there is many a hopeful aspect. I am willing to believe that once the emergency is over the Federal Power Commission, as in the case of other regulatory bodies, will mellow with time and will begin to recognize the laws of economics rather than to close its eyes to those laws.

You can see that I am not too pessimistic about the outlook for the natural-gas industry. Were the past trends I have discussed to continue, I might feel differently, but I am convinced, as I have stated, that many of these are going to change or are in the process of changing. Really, our paramount worry is a national one, namely, the infiltration of the forces of inflation into our economy. With all the efforts of the present administration to thwart these forces, they are inevitably taking hold, although I do not believe anyone can deny that, without price controls, rationing, increased taxation and other similar devices, our country would be considerably more inflated than it is at present. Deficit spending cannot be attributed to the war period only, for we have had it ever since the New Deal became the ruling power in this country, but on the other hand, it must be admitted that the deficit spending before the war will prove to be only a small per cent of the deficit spending that is necessary during the war. No matter what the cost, we must be prepared to make every sacrifice to win the war. The public debt at the end of 1942 was estimated at $72,000,000,000, at the end of 1943 it will be around $135,000,000,000, at the end of 1944 it will be around $211,000,000,000 and possibly before the end of this war it will amount to $300,000,000,000.

Deliverability of Gas Compelling Attention

(Continued from Page 62)

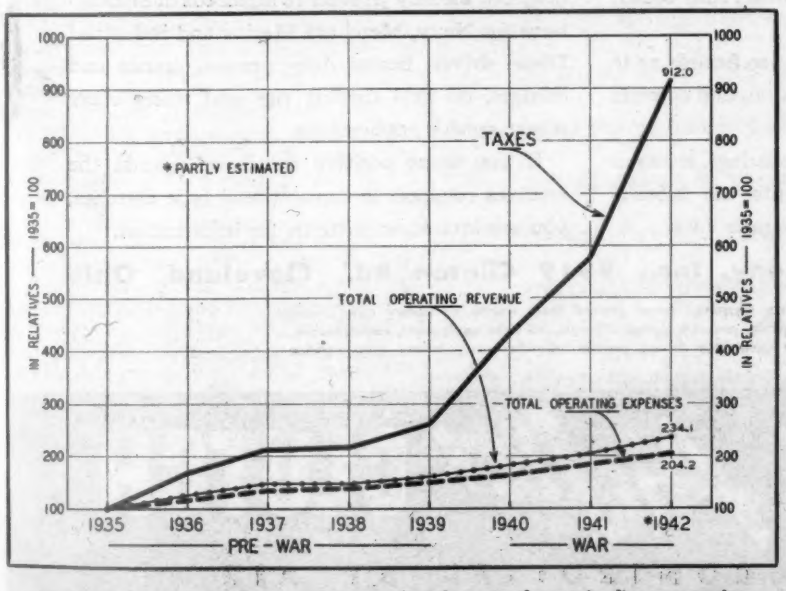
tirely new main gathering lines. The amount of steel required in individual cases is measured somewhat by the volume of new gas required to be replaced on the maximum system day and the location of the new supplies with respect to transmission mains—a part of this construction requirement can be met from time to time by lifting and relaying lines and moving idle compressor equipment but in many instances the only practical solution lies in the use of new materials. There is growing evidence of this type of need in some localities; it is not something to postpone until the day of actual necessity; it is not a postwar problem; it is a must that calls for planning and execution in advance of the day of actual shortage of gas.

Production Needs Paramount

I do not believe it is an overstatement to say that these production needs of the industry are of sufficient importance to justify their full recognition. They are inherent with our type business and to meet the need would only be giving fair consideration to the values and economies which can be derived from the maximum use of natural gas in the war program. It is the industry's responsibility to show the way and press for those considerations to which it is justly entitled. It is the responsibility of the War Production Board and Petroleum Administration for War to see that the natural-gas industry receives a fair proportion of such total supply of critical materials as can be made available for use by essential industry.

This discussion so far has dealt largely with matters that relate only to the continuance of our business of producing and transporting gas to points of consumption on the basis of present market demands. This is not the full story of the critical materials situation presently confronting the industry. During recent years many new markets have been attached and war conditions have brought about many new manufacturing processes and new industrial plants; all of these combine to create added demands for our service. In instances, the resulting conditions call for increased transmission capacity in the form of additions to plant, which becomes an involved problem in these days of shortages, high taxes, increased expenses, reduced operating and construction personnel, and lowered earnings in many individual cases.

There is no escaping the fact that war conditions bring about strange situations. Situations that depart so radically from normal processes that, to paraphrase, seem, in instances, to make bedfellows of businesses that heretofore have been active competitors. I refer particularly to the transportation of natural gas and its relationship to the whole transportation problem. If one form of transportation breaks down, the deficiencies of that one must be made up by another, and the one being already overloaded, the whole thing breaks down. As a result, the public suffers inconveni-



Trend of revenue, expenses and taxes of eight natural-gas pipe-line companies

Revolutionary...

12 advantages

1. Simple in design and operation
2. Flexible control by air
3. No adjustments or oiling—low maintenance
4. Dampens vibration—absorbs shocks
5. Corrects misalignment automatically
6. Smooth starting—no jerks
7. Runs cooler—uniform pressure
8. Controls torque by air pressure
9. Greater capacity—more compact
10. Remote control by air valve
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12. Acts as clutch, slip-clutch or brake

It grips like a giant's fist—yet it can be slipped or "inched" at will. Starts smoother, runs cooler, under uniform pressure.

It is positive in operation, yet so flexible as to absorb terrific shocks and vibration, and corrects misalignment automatically.

It is long wearing—needs no bearings, levers or toggles—requires no adjustments—no lubrication. Its control is a single pneumatic valve.

It is the FAWICK AIRFLEX CLUTCH—new, but already *proved* in hundreds of installations for Navy, Merchant Marine and industrial Diesel drives, heavy duty presses, cranes and dredges, oil field drilling rigs and many other severe-service applications.

If you want positive insurance against the troubles common to conventional type clutches, you are invited to write us for information.

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Fawick Airflex Clutches have proved their worth for heavy duty Diesel drives, steel mills, presses, power shovels, oil field equipment, compressors, hoists, motor generator drives, power takeoffs—any heavy duty service

FAWICK *Airflex* CLUTCH

ence and the war effort is retarded. My point is, that under existing conditions, all forms of transportation are interrelated and interdependent, therefore it becomes the duty of the men in our industry not only to look to the gas-supply phase of the business, but to see that the facilities used to carry natural gas from the well to the consumer are carefully maintained and fully and effectively operated. Anything less would simply mean that we are not doing our part.

Turning for the moment to the retail branch of the industry, certain restrictions on the sale of natural gas were placed in effect in many parts of the country more than a year ago. From time to time these prohibitions against sales have been extended to other areas until now there are but few gas utility companies and market areas that are not affected. Then too, the manufacture and sale of gas appliances have felt the heavy hand of the oppressor—war. None will deny that these war measures, of forced curtailment of the normal growth of gas utility sales, have resulted in substantial contributions of both critical materials and a vital fuel, to the war effort and few question the wisdom of this action. Even a superficial check of the present activities of gas-appliance manufacturers will show that many of their plants are busily engaged in war work and their contribution is a material one whether in the form of specialized equipment for war-plant industrial processes or the manufacture of munitions.

New Developments Compulsory

Out of all of the chaos and waste and destruction that accompany war, if we but look beyond the present confusion and uncertainty we shall be able to glean some satisfaction in the fact that the very forces that would destroy us, compel advancement if we become strong enough to defeat the enemy. This compelling influence has already resulted in marked progress in new developments, through scientific skill, and the resulting advancement far outstrips that which we would otherwise witness over a long period of years. With the coming of peace, this creative effort, of the war period, will bring forth new horizons and afford new opportunities. While it will take vision and courage to measure up to the opportunities and responsibilities of the future, we know that the natural-gas industry has such attributes of character within its ranks. Nothing less would have established this industry that today is an outstanding example of accomplishment under a system of free enterprise. To these men the things to come after the war, offer new fields in which to spread the benefits of a superlative fuel and further opportunity for the history of this industry to repeat itself.

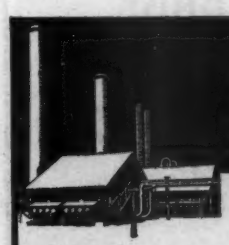
Broadening this appraisal of the present state of the natural-gas in-

"The life and soul of science is its practical application."
—Lord Kelvin

1821-1894
Herman Ludwig Ferdinand von Helmholtz, after achieving fame in physiological optics, devoted his researches to physics among which thermodynamics was notable.

Helmholtz developed the recognized theories of the equivalence of energy and heat which resulted in some of the primary laws of thermodynamics.

Engineering is applied science. Perhaps some of the most notable engineering achievements are in the field of petroleum refining. Here the controlled, economical application of heat demands a specialized engineering skill in the design and construction of heaters. A pioneer in this field, Alcorn for nineteen years has provided all types of heater installations to meet the exacting requirements for the processing of all types of petroleum products.



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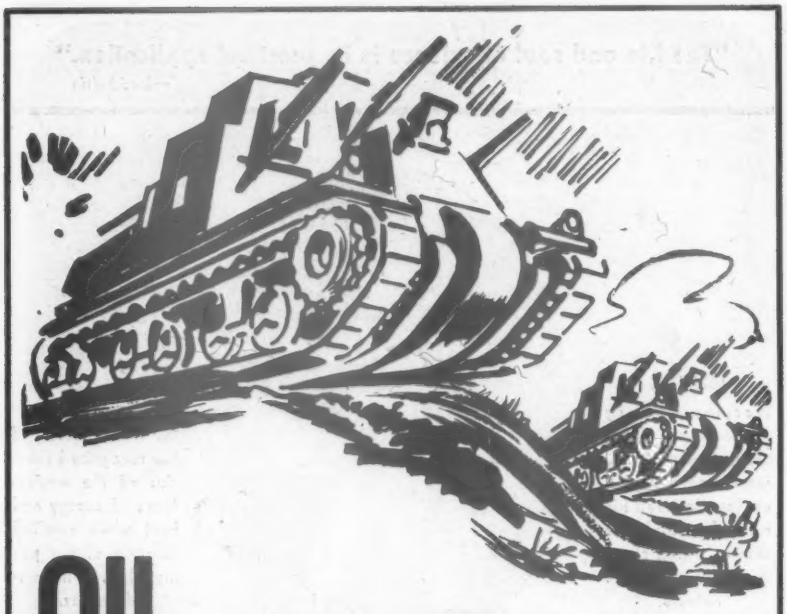


OIL KEEPS 'EM "ROLLING!"

The precious life-blood of our armored forces . . . the tanks of Africa, the planes, trucks, and jeeps—will help write tomorrow's headlines! The United States and her allies are grateful for the increasing efforts put forth and the unfailing services rendered by the petroleum industry.

The Banks of Fort Worth stand ever ready with complete facilities and long experience to serve in financing any phase of the oil business.

THE FIRST NATIONAL BANK
THE FORT WORTH NATIONAL BANK
CONTINENTAL NATIONAL BANK
OF FORT WORTH

dustry, I might add these observations.

Known natural-gas reserves on a country-wide basis, estimated to exceed 90 trillion cubic feet, are probably the largest in the history of the industry. Therefore, the supply problem reduces itself to the matter of maintaining deliverability and making known reserves available to those areas where the rate of discovery has not kept up with that of withdrawal. This in short is the crux of the whole supply situation.

The retail branch of our business, except as it is influenced by the expansion of service to war industries, continues to function under enforced conditions of status quo, which from all outward appearances will continue for the duration. As a result, merchandising has been materially reduced and most construction activity suspended.

Manpower Losses Serious

The whole industry has suffered a serious loss of manpower through enlistments and the effect of the Selective Service Act. One recent survey showed that such losses varied from a minimum of 7 or 8 per cent to a maximum of 35 per cent. The ratio of this loss by groups, to the total number of employed persons is influenced by the average age of the group. Then too the labor situation has been further aggravated by the loss of workers who are attracted to other industries because of higher rates of pay. The whole situation will undoubtedly grow more acute and while there are many things we can and should do to keep intact the necessary operating personnel of this essential industry, there is no escaping the fact that as time passes we shall become more and more conscious of the importance of women workers and oldsters in the natural-gas industry.

Try as I may to look upon the dark side of things, I always find some favorable factors in our business outlook. Right now we are enjoying a larger volume of sales than ever before in our history and while taxes and other forms of expense cut heavily into income, it is my conviction that the industry remains in a strong position. True, many companies have been hurt earnings-wise, yet in contrast, a few have registered gains. On the whole, an analysis would show that the affairs of the natural-gas industry are in a sound state. It has suffered fewer dislocations than many other types of business. Its record is clean. There has been no hint of scandal in the conduct of its affairs. Its business is intact. Furthermore the industry's service has been of such nature as to warrant the belief that we have strengthened the ties between company and customer and in contrast with the general upward trend in the cost of practically all

commodities, the cost to the consumer of natural gas, with few exceptions, has not risen and in several areas substantial price reductions have been made. This war-period record is impressive and one that we may be proud of. To me, it exemplifies the spirit of this industry.

Pipe Protection and Metering Features of Distribution Session

CINCINNATI, Ohio.—The twentieth annual natural-gas distribution conference, sponsored by the technical section of the American Gas Association, was held here last week, April 29 and 30, featuring metering and pipe protection.

R. F. Hadley, electrical engineer, Susquehanna Pipe Line Co., Philadelphia, Pa., was chairman of a round-table luncheon conference April 29 dealing with the subject, "Pipe Coatings and Corrosion." In the morning session the same day, A. V. Smith, consulting engineer, Philadelphia, delivered a paper on "Cathodic Protection Interference."

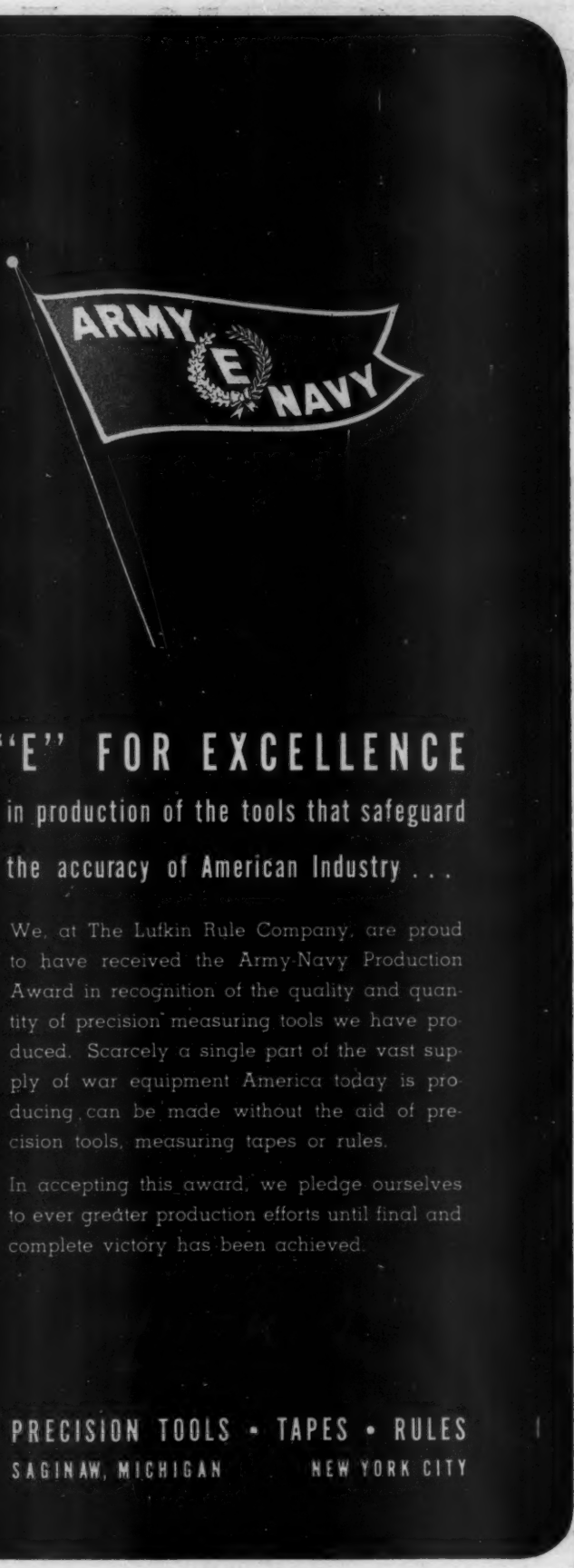
A second luncheon conference April 29 was devoted to the general topic, "Work on Customers' Premises," presided over by W. T. Collins, Ohio Fuel Gas Co., Columbus, Ohio. The discussion included consideration of women's part in the gas industry and employe training practices.

"Meters and Metering" was the general luncheon-conference topic April 30 which dealt with all phases of natural-gas measurement under wartime conditions. Emphasis was placed on tin conservation and the solder situation for building and repairing meters. J. H. Collins, New Orleans Public Service, Inc., New Orleans, La., presided.

General service questions and practices in reconditioning and reclaiming pipe lines were discussed at a construction and maintenance conference April 30 presided over by T. H. Kendall, Equitable Gas Co., Pittsburgh, Pa.

A. F. Bridge, president, and Maj. Alexander Forward, managing director, American Gas Association, opened the distribution conference with greetings to the representatives. They outlined the necessity of maintaining equipment in service as long as possible and pointed out that the exchange of experiences and theories at conference discussion is particularly important under existing shortages of materials.

James G. Stewart, mayor of Cincinnati, and H. C. Blackwell, president of the Cincinnati Gas & Electric Co., welcomed those attending the distribution conference.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"E" FOR EXCELLENCE
in production of the tools that safeguard
the accuracy of American Industry . . .
We, at The Lufkin Rule Company, are proud to have received the Army-Navy Production Award in recognition of the quality and quantity of precision measuring tools we have produced. Scarcely a single part of the vast supply of war equipment America today is producing can be made without the aid of precision tools, measuring tapes or rules.
In accepting this award, we pledge ourselves to ever greater production efforts until final and complete victory has been achieved.
PRECISION TOOLS • TAPES • RULES
SAGINAW, MICHIGAN
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Plants Go Streamlined!

Metric-American orifice meters at a simplified new gasoline plant where equipment and controls are kept at a minimum. The finished liquid product is piped to a refinery at which high-octane aviation motor fuel is made, while the residue gas is sold to a utility which manufactures electric current for war plants.

PLANT SIMPLIFICATION is in order . . . stipulated for new construction or remodeling. This stripping of "non-essentials" applies to equipment as well.

New emphasis therefore is placed on the more practical scientific applications of measurement and control instruments. Their duties are enlarged. Their selection must be scrutinized with greatest care, since replacements to cover "mistakes" may be difficult.

Such new and heavier responsibilities are safely entrusted to Metric-American orifice meters, flowmeters and controls. They have a complete range and adaptability within their fields; a proven efficiency that is a matter of performance record the country over.

These American Meter Company instruments themselves are streamlined for elimination of all superfluous or vulnerable parts. Practical instruments . . . sensitive yet rugged . . . they have fewer working parts; less angular movement and less friction in travel, counterbalances and safeguards to insure closer accuracy. Low-cost accuracy at maintained highest standards!

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1931

Operating Features of the KATY GAS-CYCLING PLANT

*by Frank G. Noble**

The Katy field in Waller and Harris counties, Texas, is one of the world's largest gas-distillate fields. Proper operation of the field is necessitated by the discovery of oil in the field and the design and operating methods used in the recently completed gas-cycling plant are of great interest. These are described in this article which was presented before the Wartime Conference of the southwestern district, A.P.I. Division of Production, Houston, Tex., April 29-30.

THE Katy gas field, located approximately 40 miles due west of Houston, Tex., is situated principally in the southeastern corner of Waller County with its outer limits extending into the southwestern corner of Harris County and the northeastern corner of Fort Bend County.

In 1939, negotiations were begun with the parties having interests in the Katy gas field for the unitization of their properties with the view of installing a cycling plant to process the produced gas for the recovery of desired liquid hydrocarbons and reinjection of the unsold residue into the producing sands for the purpose of gas conservation. Agreements of interested parties regarding basic contracts for the project operation were completed by May 1941.

After completion of these basic contracts, immediate plans were drawn for the installation of a gas-cycling plant, the purpose of which, in addition to the above operations is to recover the essential products of butanes, gasoline, and other hydrocarbon fractions to be utilized in the manufacture of aviation-gasoline, rubber, toluene and other products.

It might be of particular interest to discuss briefly some of the features of the plant design and operations as to methods employed in handling the high-pressure gas, extracting the desired butanes, processing of gas for gas sales, the unusual arrangement and operation of the steam system, as well as other design features.

Plant Design

Recent trends in the design of most gas-cycling plants have been toward the installation of plants with large gas-processing capacity, usually 100 to 200 million cubic feet of gas per day. Considerable study was given to the proper size plant to produce the Katy gas field, and it was concluded that a plant of the oil absorption type with a processing capacity of 275 million cubic feet of gas per day would permit economical processing of the gas over a period of 30 to 40 years.

The plant is designed to process 275 million cubic feet per day of gas from the producing wells, recovering 80 per cent of the potential butanes and practically all of the pentane and heavier hydrocarbons. Approximately 235 million cubic feet per day of wet gas will enter the four high-pressure absorbers operating at 1,800 lb. per sq. in. The absorber residue gas, with a volume of around 210 million cubic feet per day, is to be returned by the gas engine-driven compressor units to the injection wells. The remaining plant capacity is utilized in the processing of gas for delivery to two sales gas-transmission systems. The rated capacity for delivery to gas sales is approximately 52 million cubic feet per day; however, the absorption equipment is sized to accommodate a reasonable overload in order to handle peak gas-sales demands.

The plant at rated capacity is expected to recover approximately 7,500 bbl. per day of total products. Stabilization and storage facilities are provided for the separation of (1) butanes, (2) 250° F. end-point gasoline, and (3) heavy distillate, as separate products. The expected production is 1,661 bbl. per day of butanes, 2,689 bbl. per day of gasoline and 3,164 bbl. per day of naphtha and distillate.

Field System

The gathering system is designed to take the unit's gas from 15 producing wells, 3 of which are dual completions. The lines are sized for a maximum daily production of 20 million cubic feet each from the edge wells, 25 million cubic feet each from the other single-sand completions, and 40 million cubic feet from dual completions. To allow for future production from the weaker and lower pressure wells in the upper sands, the lines are designed for a pressure drop of 200 lb., assuming 2,200 lb. per sq. in. at the plant and 2,400 lb. per sq. in. at the well meter settings. The gathering system is designed for a working pressure of 2,700 lb. per sq. in. at 130° F.

Each producing well is equipped with a meter setting for metering the gas produced from each sand. For the lower sand wells there is a single-wing casing and tubing connection with 2-in. adjustable chokes for controlling the flow. For the upper sand single-completion wells the casing is connected by a double 4-in. wing, and the tubing by a single wing, and the tubing by a single-wing connection, equal in size to the tubing. Each wing has an adjustable choke for controlling the production rate. For dual-completion wells the well-head connections are the same as for the upper-sand wells.

The injection system for returning gas to the injection wells is planned so that reasonable distribution control may be maintained. Control of the gas-cycling "pattern" will neces-

*Natural Gas and Gasoline Department, Humble Oil & Refining Co.

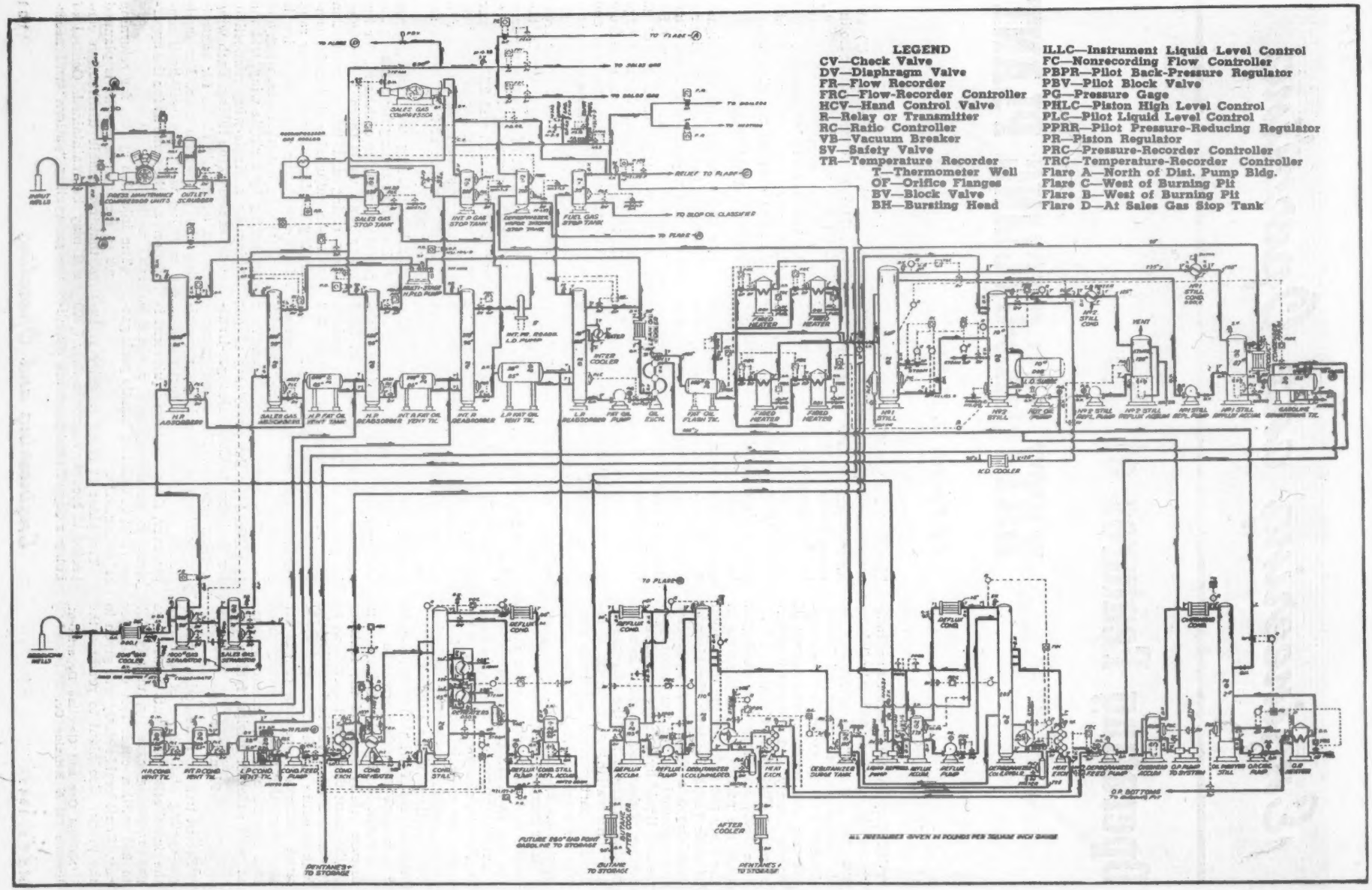

Fig. 1—Flow diagram, Katy recycling plant

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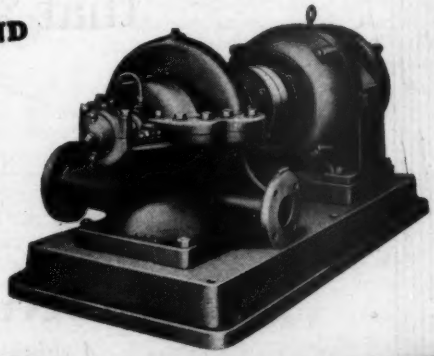

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sitate variations in gas-injection rates to the various wells during the period of operations. The injection field lines are designed so that approximately 50 million cubic feet could be delivered to each injection well with a maximum pressure drop of 100 lb. between the compressors and the injection well heads. Of this pressure drop, about 25 lb. is due to line losses at the plant, expansion bends, meter setting, and well-head connections.

A comparison was made of the merits of individual lines between the plant and the injection wells as against a large line from the plant to each end of the field with laterals to each injection well. It was found in this particular case that, for a given pressure drop, the individual lines had about 25 per cent more capacity, required approximately 250 tons less steel, and resulted in a lower installation cost.

The injection field lines are 7⅝-in. o.d. (0.625-in. wall thickness) pipe. The meter setting and pipe within 125 ft. of the injection well are 6⅝-in. o.d. (0.718-in. wall thickness) pipe. All piping is designed and constructed in accordance with the A.S.A. code for high-pressure piping, using Grade B seamless pipe. Each injection well has two 4-in. casing and one 2½-in. tubing connection with a check valve installed on each well-head connection. The field lines are securely anchored at each end and between each expansion bend provided in the line. Expansion bends are also installed at the well head to provide for expansion in the well casing. The injection system is designed for a working pressure of 3,500 lb. per sq. in. at 175° F.

High-Pressure Gas System Within Plant

The accompanying plant "flow diagram," Fig. 1, illustrates the essential features of the plant process design and is to be referred to in illustrating the various systems involved.

The producing wells, at an average flow rate of 25 million cubic feet per day each, have a pressure at the well head of approximately 2,450 lb. per sq. in. and a flowing temperature of 165° F. The wet gas arrives at the plant at a pressure of 2,200 lb. per sq. in. and a temperature around 135° F. The gas, to be processed in the high-pressure absorbers and handled through the compressor unit for reinjection to the producing formation, is first cooled in the high-pressure cooling coils located in the cooling tower. Such cooling reduces the gas temperature from 135° F. to 90° F. at inlet plant pressure. After cooling, the gas is delivered to the 1,800-lb. system through two headers and pressure reducing regulators which control the absorber and compressor suction pressure at 1,000 lb. per sq. in. Before introducing the gas into the four 1,800-lb. absorbers, it is passed through two separators operating in parallel to remove the liquid formed by previous cooling and pressure reduction. The discussion of this liquid flow will follow under the "condensate flash and process system."

Gas from the separators operating at 1,800 lb. per sq. in. is next delivered and equally distributed to four absorbers operating in parallel. Sufficient absorption oil contacts the gas for the extraction, at this point, of 84 per cent of the butanes. The residue gas is then passed through two scrubbers in parallel operation where any entrainment or large quantity of liquid that might be carried overhead from the absorbers, due to mechanical "upset," will be automatically collected and drained. The gas then goes into the compressors for delivery to the injection wells. All gas volumes referred to in this discussion are at a pressure base of 14.7 lb. per sq. in. absolute and 60° F. temperature.

The compressor unit has seven 800-hp. compressors, each machine consisting of two double-acting horizontal compressor cylinders directly connected to an eight-cylinder power engine operating at 330 r.p.m. The compressors are installed to deliver 210 million cubic feet per day of high-pressure absorber residue gas to the injection system and wells at a suction pressure of 1,800 lb. per sq. in. and a discharge pressure of 3,000 lb. per sq. in. A closed jacket cooling water system is provided for the unit, the makeup water being condensed steam from the power plant system. The jacket-water coolers are of the closed-shell and tube type and are arranged with a bypass and necessary control equipment to maintain the desired jacket-water temperature. A 100-hp. electric motor-driven centrifugal pump circulates the required quantity of jacket cooling water.

Sales-Gas System

Facilities for supplying the high-pressure residue gas for sale to the two gas-transmission systems located in the field center primarily around the operation of two 800-lb. sales-gas absorbers and the 600-lb. high-pressure reabsorber. A stream of the wet gas from the field producing wells is withdrawn upstream from the high-pressure gas coolers and reduced to 800 lb. per sq. in. by means of an instrument operated control valve. Due to pressure drop, the temperature of the gas will be lowered from 135° F. to approximately 80° F. A heater is installed in the line to prevent hydrate formation at low temperatures. The gas, along with the liquid formed by pressure reduction, is next delivered to the sales-gas separator where the liquid is removed and the gas passed to the two sales-gas absorbers operating in parallel. Sufficient absorption oil contacts the inlet gas to extract approximately 79 per cent of the butanes. The residue gas, after leaving the absorbers, goes to a 600-lb. operating-pressure reabsorber and with the recompressor discharge vapors, the total gas from this stop tank then passes through control equipment and into the sales-gas systems. The control scheme of the system is such that either constant gas volume or constant pressure may be maintained on one of the gas systems, while gas delivery to the other system is designed for constant pressure only. A primary pressure reducing regulator on the high-pressure inlet wet gas floats on the line so as to maintain 800 lb. per sq. in. on the sales-gas absorbers regardless of the variations in sales-gas deliveries.

Reabsorption System

One of the major problems encountered in the design of a process employing a pressure in the primary absorbers of 1,800 lb. per sq. in. is the proper removal of the tremendous quantities (approximately 16 million cubic feet per day) of methane and ethane dissolved in the rich oil from the absorbers. The most practical method of eliminating these undesirables, and yet retaining butanes, is by stage reduction of pressures and reabsorption of the desirable hydrocarbons. Careful consideration was given in the design to selection of the optimum pressures for these flashes and reabsorptions. As a result, the rich oil from the 1,800-lb. absorbers combines with that from the sales-gas absorbers and is flashed successively at 600, 200 and 35 lb. per sq. in. The flashed gases are contacted at respective pressures in the reabsorber for the desired butane retention. The residue gas from high-pressure reabsorber is delivered to the sales-gas system. The residue gas from the intermediate-pressure reabsorber is used for plant fuel, any excess being recompressed, cooled and delivered to the sales-gas system. The residue gas from the low-pressure reabsorber supplies fuel for the boilers and direct-fired heaters. It is not necessary under the above system of rich-oil flashes and reabsorptions to design for a high per cent butane extraction in any of the reabsorbers. The favorable result is in that the rich-oil feed to the still system contains a minimum of dissolved methane and ethane hydrocarbons.

Condensate System

A separate system is provided for processing the liquid formed by retrograde condensation and separated from the gas in the 1,800-lb. and 800-lb. sales-gas separators. It may be of interest to point out several of the factors which influence the selection of this design.

1. To eliminate possible future difficulties with salt water or other contamination of the absorption oil system.

2. To relieve the steam stripping loads on absorption oil stills.

3. To permit partial operation of

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the plant when units of the absorption plant are shut down.

4. To give added flexibility for varying the end point of the gasoline product.

The liquid separated in the 1,800-lb. inlet gas separators is flashed into the sales-gas separator, operating at 800 lb. per sq. in. This permits reabsorption of the flashed gases at optimum pressure and reduces the quantity of field wet gas required to supply the sales-gas demands. The 800-lb. separator liquid is further flashed in stages to 600, 200 and 35 lb. per sq. in., the flashed gases going to the previously mentioned reabsorbers operating at these respective pressures. In this manner, all of the flashed vapors are properly processed in the reabsorption system for the retention of the desirable butanes. The liquid from the low-pressure condensate flash tank is delivered by pump through heat exchangers, a preheater, and into the condensate still operating at 45 lb. per sq. in. Sufficient stripping steam is introduced into the base of the still to effect the removal of all the 250° F. end-point and lighter hydrocarbon fractions, the overhead vapors passing through a condenser where approximately 90 per cent condensation is obtained. External reflux is returned by the reflux pump to the top of the still for the desired end-point control of the overhead product, while the net overhead product is introduced as liquid into the vapor stream from No. 1 still, just upstream of the final product condensers. The product from the base of the condensate still is heat exchanged against the feed material and then delivered to storage as gasoline free distillate.

Distillation System

The primary purposes of the distillation system are to process the rich oil from the absorption unit, remove the desired gasoline fractions, and provide a well stripped heavy-absorption oil for recirculation to the absorption system. To accomplish these, it is necessary to operate a two-still system. The No. 1 still, operating at 90 lb. per sq. in., is designed to remove the 250° F. end-point gasoline product from the rich oil. This is accomplished by pumping the rich oil from the absorption system through heat exchangers and direct-fired heaters to bring the temperature level to 530° F. Sufficient stripping steam effects the removal of the desired overhead fractions while a hot reflux controls the gasoline final boiling point. The liquid condensed from the overhead of this still provides the raw charge to the stabilizers.

Oil leaving the base of the No. 1 still contains hydrocarbons boiling between 250° F. and 500° F. The No. 2 still, operating at 5 lb. per sq. in., receives this oil feed for further processing at approximately 500° F. Sufficient stripping steam removes the heavy hydrocarbons and gives control on the initial boiling point of the absorption oil from the bottom of the still. The stripped absorption oil is next pumped through the heat exchangers and final oil coolers and to the various absorbers. The overhead product is condensed and delivered to storage with the bottoms from the condensate still.

The absorption oil for the sales-gas absorbers and the high-pressure reabsorbers is withdrawn as a side stream from the main high-pressure, lean-oil pump. The pump for delivering the oil to these absorbers is a 1,900-hp. steam-turbine-driven centrifugal unit. It is designed to handle a normal load of 1,340 g.p.m., 250 g.p.m. being withdrawn at 800 lb., while 1,090 g.p.m. is pumped to the four high-pressure absorbers operating at 1,800 lb. per sq. in. The total absorption oil circulation for the plant amounts to 1,673 g.p.m. of 36-gravity A.P.I.-500° F. initial boiling-point oil.

Stabilization Unit

The stabilization unit is designed to produce two finished products. They are (a) a mixture of butanes, with or without propane, and (b) a butane-free specification end-point gasoline. These products, in addition to the heavier fractions from the distillation

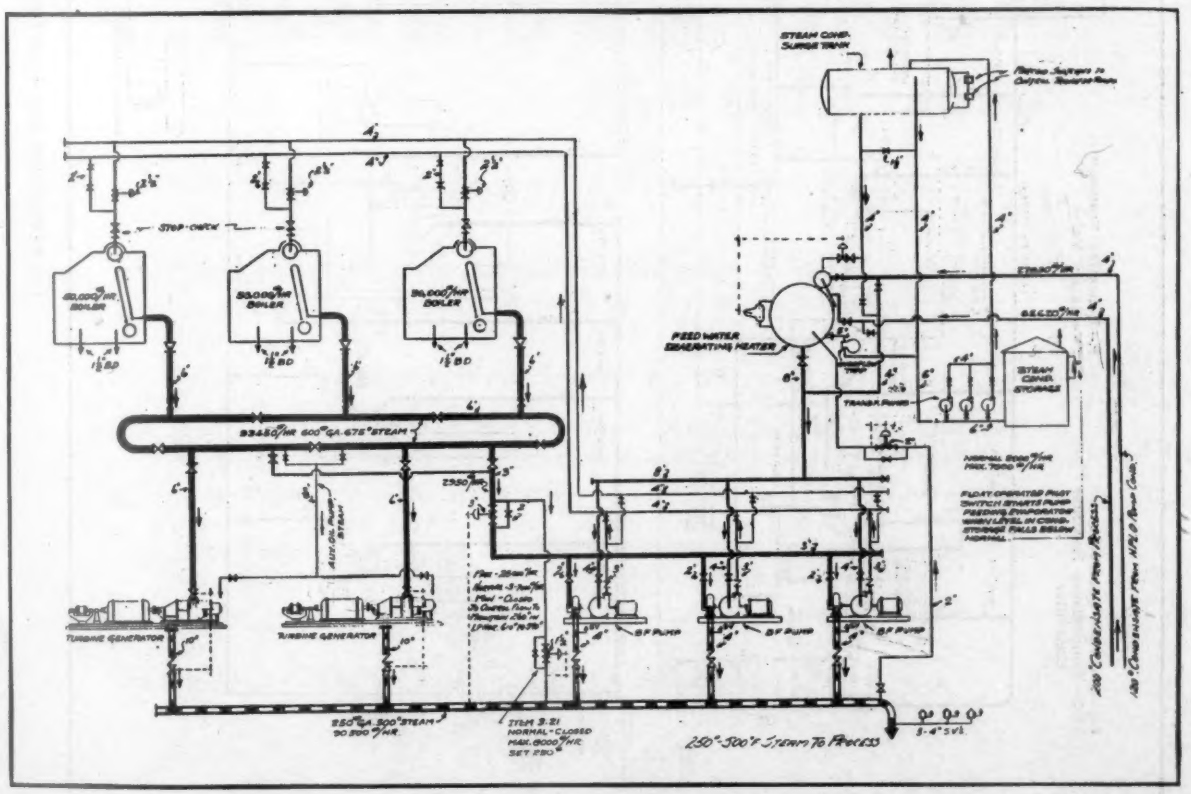

Fig. 2—Flow diagram of power plant, Katy gas-cycling plant, Katy, Tex.

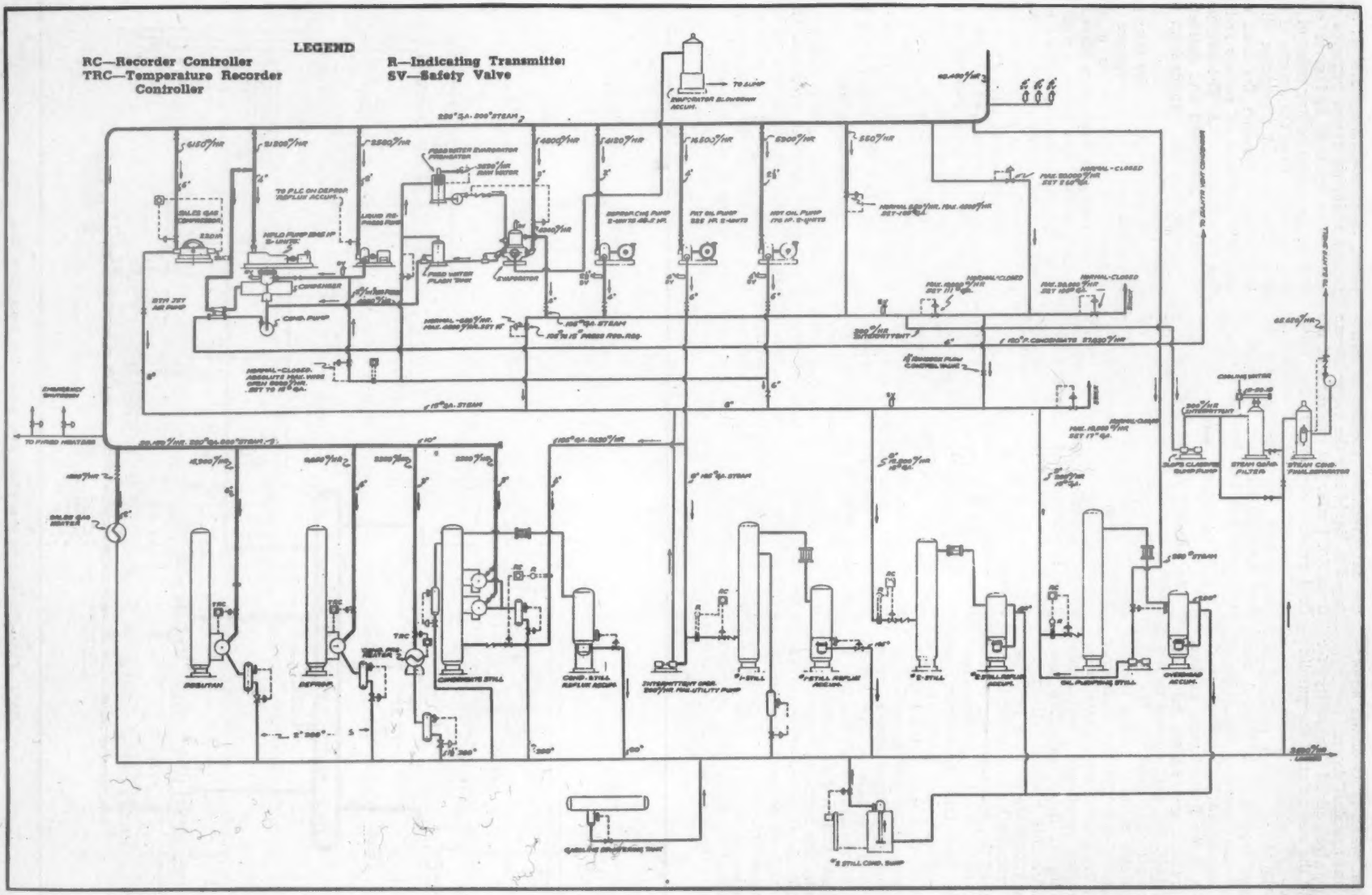

Fig. 3—Distillation area steam flow, Katy gas-cycling plant, Katy, Tex.

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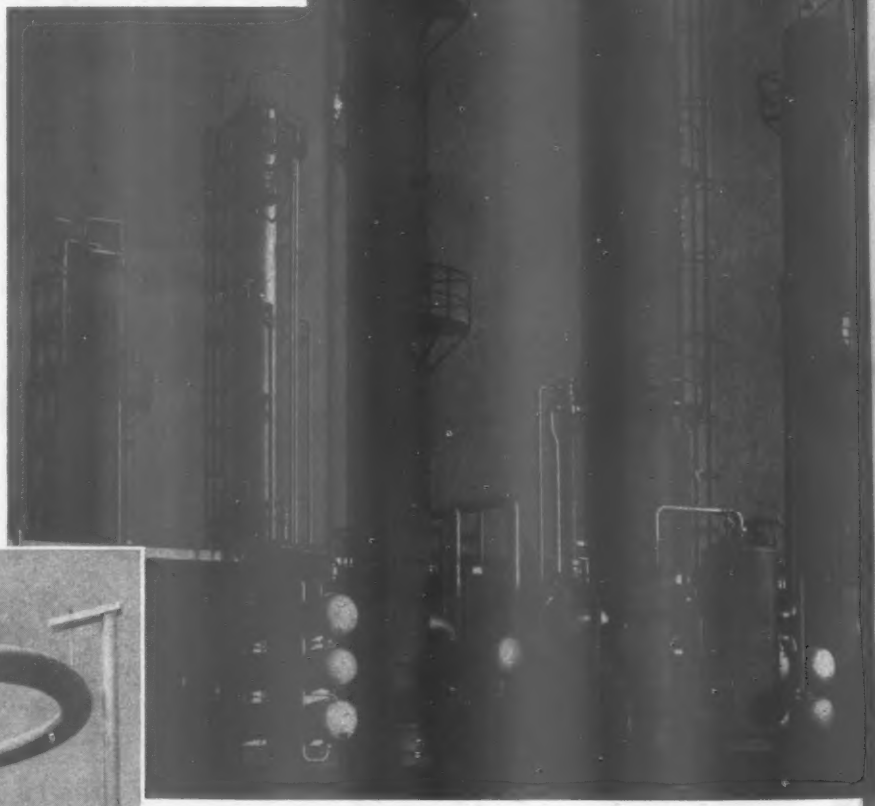

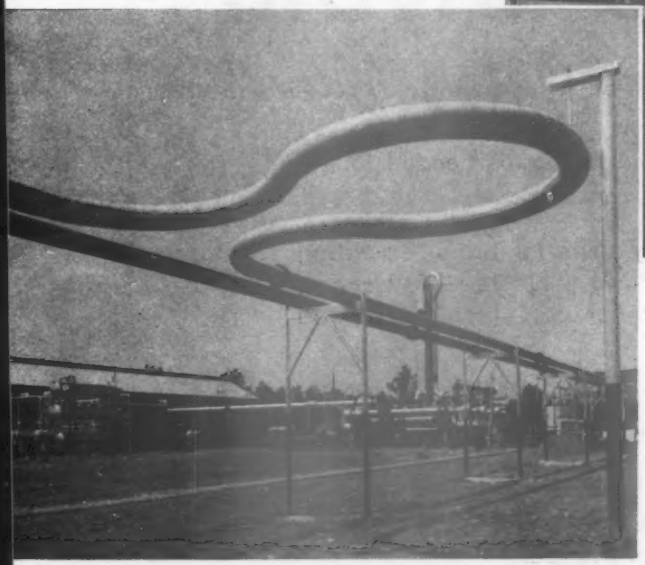

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system, constitute the plant's total production.

The stabilizer scheme followed in the plant design is similar to the arrangement of most stabilizer installations. However, the depropanizer unit has one particular feature which is seldom found in other plants of this nature. The raw gasoline feed material, containing a small quantity of methane and ethane hydrocarbons, is pumped into the depropanizer operating at 285 lb. per sq. in. Practically total condensation is obtained on the overhead material of propane and lighter hydrocarbons upon cooling this stream for reflux.

A turbine-driven triplex repressuring pump with 285 lb. suction pressure and 3,400 lb. discharge pressure will handle all excess reflux, thus permitting the return of this material as a liquid into the discharge header of the main gas compressors and hence to the injection wells. This method of operation affords a saving in investment as well as the elimination of a recompressor, thereby reducing the operating expenses.

The liquid from the depropanizer reboiler, consisting of the butanes and heavy hydrocarbons, is next fractionated in the debutanizer column. Here the butanes are removed as an overhead specification product, while the final gasoline is withdrawn as a bottom product. The butanes are condensed and transferred to two 5,000-bbl. spherical tanks for storage while the gasoline fraction is cooled and delivered to three 5,000-bbl. spherical storage tanks.

Humble Pipe-Line Station

The Humble Pipe Line Co. has a pump station located on the plant site to handle deliveries of the plant products to the Baytown refinery. The butane product is pumped to the Satsuma-East Texas gasoline line through 17 miles of 4-in. pipe. The gasoline and heavier products are pumped through 9 miles of 4-in. pipe line to the Raccoon Bend pumping station.

Steam and Power System

Steam.—The steam and electric system for the Katy gas-cycling plant is quite unusual as compared with that encountered in most plants of this nature. During the preliminary discussions of the plant design, it was decided to use steam and electrically driven centrifugal pumps where practical. The plant process required approximately 95,000 lb. of steam per hour at 250, 105 and 15 lb. per sq. in. pressure, and an electric power and lighting load of 1,740 kw.

Comparisons were made of the various combinations of steam and electric drives for the different services and combinations of condensing and noncondensing steam plants operating at 250 and 600 lb. per sq. in. steam pressure. These comparisons included installation and operating costs and trial heat balances.

After analyzing the various power schemes, the most attractive was the generation of steam at a pressure of 600 lb. per sq. in., generating the required electrical load by back-pressure steam-turbine-driven generators, and staging the steam pressures down through the plant so that the total steam required for the generator drives balanced the requirements for process heating, stripping, and pump drives.

Steam System

A brief discussion of the steam system will illustrate the principal features of interest. Fig. 2 shows the arrangement in the power plant, while Fig. 3 details the methods of utilizing the steam in the distillation system.

To meet the processing requirements of steam, three 700-lb. working pressure boilers are installed. Each boiler is designed to produce 50,000 lb. per hour steam at 600 lb. pressure and 675° F. temperature. The boilers are of the integral furnace type, completely water walled, and equipped with forced and induced-draft fans with stub stacks.

For the calculated electrical load of 1,740 kw., there are installed two 2,000-kw., 440-volt, three-phase, 60-cycle, 3,600-r.p.m. turbogenerators. The turbines operate at 600 lb. inlet steam pressure and throttle to 250 lb. back pressure. Normally, two boilers and one turbogenerator will be operated.

Steam from the 600-lb. header is used to drive the generator and boiler feed-pump turbines, the exhaust pressure from these turbines being maintained at 250 lb. per sq. in. The exhaust steam at 250 lb. per sq. in. is next utilized in the distillation unit process for heating, stripping and driving certain pumps. The steam as utilized in these services is all condensed and returned to the deaerating heater for feed for the boilers. An elevated surge tank maintains constant makeup water to the heater and any excess water overflows to the storage tank. The pumps at the storage tank are operated automatically to maintain proper water level in the surge tank, while a float-operated switch controls the operation of the makeup evaporator to maintain constant water level in the tank.

There are three dual-drive centrifugal feed water pumps, operating at 3,550 r.p.m. each, driven through a flexible coupling by a 150-hp. motor at one end and by a steam turbine at the other end.

An automatic regulating valve in the steam line to the three turbines divides the power input to the pumps between the turbines and motors for the purpose of controlling the steam pressure in the 250-lb. exhaust header.

Complete automatic combustion control equipment is installed on each boiler for maintaining pressure, forced draft, furnace draft and induced draft.

Utilization of Steam From Boiler House

The distribution and utilization of the steam from the boiler house at a pressure of 250 lb. per sq. in. is one of the most interesting systems in the plant. Approximately 56,450 lb. per hour of steam is required for driving the various pumps in the distillation system while 36,450 lb. per hour are utilized in heating in the stabilizer reboilers, the condensate still preheater and reheaters. A steam demand of approximately 25,000 lb. per hour at a pressure of 105 lb. per sq. in. is required for stripping in the No. 1 still and condensate still. The turbines driving the fat-oil pumps and the depropenizer charge pump are of the back-pressure type, exhausting into 105-lb. steam header. The steam from the makeup evaporator goes into this header. The 105-lb. steam is next used in stripping as illustrated. The quantity of stripping steam required at 15 lb. per sq. in. is 12,700 lb. per hour. To provide this steam, the turbines driving the hot lean-oil pump and recompressor exhaust into a steam header operating at 15 lb. per sq. in. The pressure in the 15-lb. steam header is controlled by means of a pressure-reducing regulator from the 105-lb. system. Sufficient regulating and relief-valve equipment is installed to prevent excessive pressure in any of the steam headers during either partial or full load operation.

The centrifugal oil pump, delivering absorption oil to the high-pressure absorbers, is driven by a 2,000-hp. steam turbine operating at 3,600 r.p.m. The inlet steam is at a pressure of 250 lb. per sq. in., while the turbine exhaust steam is piped into a 2,800-sq. ft. surface condenser operating under 4 in. mercury back pressure. The exhaust steam from the turbine driving the liquid repressuring pump along with any exhaust steam from the 15-lb. steam header is also introduced into this surface condenser. The condensate from the hot well of the condenser is returned by pump to the deaerating heater in the power plant.

The condensate steam from the various units of distillation equipment is returned to a steam condensate filter and separator system where any trace of oil or contamination will be removed and the condensate returned by centrifugal pump to the deaerating heater located in the boiler plant.

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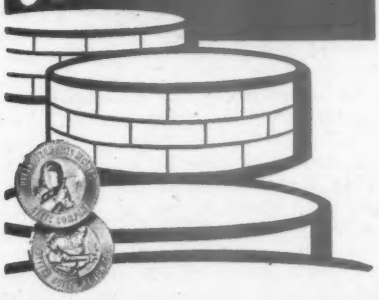

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practically total return of condensed steam for feed to the boilers. The expected makeup requirement is less than 5,000 lb. per hour.

Electrical.—The main switchboard located in the power plant is of the dead front, metal enclosed type with drawout circuit breakers and interconnecting bus structures for the control of the underground system rated at 440-volt, three-phase, three-wire, 60-cycle current. Main generator and feeder panel breakers are electrically operated with the distribution panel breakers being manually operated with inverse time delay trip and several are equipped with shunt electric trip.

Two sets of underground cables are run in separate fiber ducts buried in concrete to separate bus ducts in the switch houses located near the cooling tower, distillation unit pump building and the compressor building, each set being protected by a circuit breaker in the power house. In order to insure continuous operation of these essential units, half of the motor load at each center will be on the breaker located on distribution board "A" and half of it on board "B." Motor load in the power plant is divided in the same manner. The system is balanced so that the entire load is almost exactly equal on the two feeder breakers.

Each motor at load centers has an explosionproof push button near it. Standard line starters and circuit breakers are located in the switch houses.

Plant Safety Features

The necessity for providing safety devices in an average gasoline plant is obvious. In a large high-pressure cycling-type plant, it is of utmost importance to give particular attention to safety features. The safety arrangements although sometimes very simple, act as guards to warn of trouble, and also to protect the equipment against damage. There are many safety features of interest in the Katy plant, a few of which will be briefly discussed.

1. **Emergency high-pressure gas-control system:** In order to protect the plant in case of some failure in the high-pressure gas system, piston-operated plug valves are installed on both the producing and injection lines at the plant boundary. These valves are operated from a series of manually operated control stations strategically located in the plant operating area. Such operation will shut off the incoming and outgoing gas, as well as shutting down the compressor unit. At the same time, another piston-operated valve will open to permit the blowing down of the high-pressure gas within the plant to a flare stack located on the south boundary of the plant yard.

2. **Protection of direct-fired heaters:** The direct-fired heaters have both a hand-operated steam snuffing system and an emergency snuffing system, which may be operated in case of tube failure or fire. As a protection against the loss of oil flow through the heaters, which may happen in the event the rich-oil pump fails, the fuel gas will automatically be shut off, thus reducing the hazard of coking up the heater. A third feature is that a failure of fuel-gas supply will automatically close the fuel regulator which must be manually reset, thus eliminating a fire hazard.

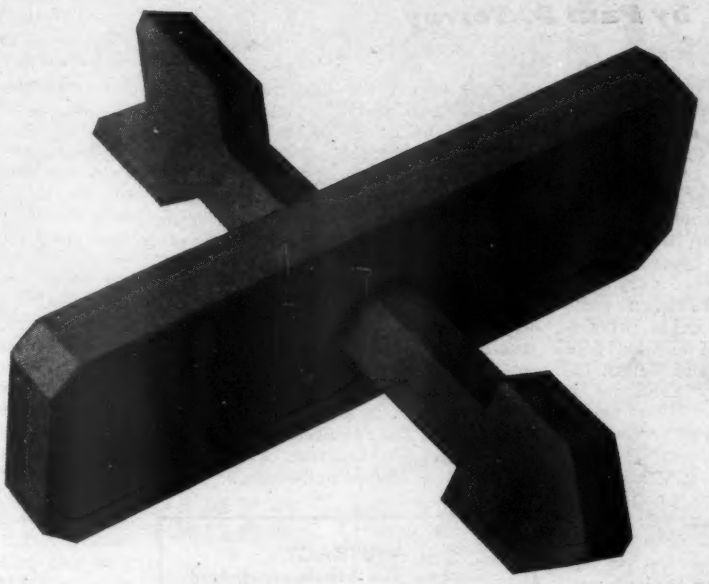
3. **General-alarm system:** In order to warn the plant operator of trouble in the system, an arrangement of alarm whistles is installed on the various vessels requiring special attention against certain adverse operating conditions. However, if the problem is beyond the operator's control, another set of safety controls will automatically shut down the major mechanical equipment, thus insuring protection against damage.

Cooling-Water System

In a cycling plant of usual design, having the capacity of the Katy plant, the quantity of cooling-water circulation would be approximately 20,000 g.p.m. By a careful balance of heat requirements and equipment installation, the Katy plant requires only 14,000 g.p.m. This reduction is a result of balancing the cooling loads for the closed shell and tube-type condensing and cooling equipment against the cooling required for the atmospheric cooling sections located in the base of the cooling tower. Approximately 14,000 g.p.m. is required over the coils in the cooling tower. The water in passing over these coils increases in temperature from 85° F. to 95° F. This 95° F. water is then pumped in parallel flow through the shell and tube equipment of (1) engine jacket water coolers, (2) exhaust steam condenser, (3) No. 1 still primary reflux condensers, and (4) No. 2 still primary reflux condensers. The water, after passing through these units, is delivered over the top of the cooling tower for distribution and reduction in temperature from 115° F. to 85° F., thus completing the cycle of water flow.

Raw water for the plant makeup is supplied from water wells in the plant yard. A 500-g.p.m. pump delivers water from the water wells to a 3,000-bbl. settling tank. This makeup water, in its route to the cooling tower, is utilized for cooling in the low-pressure reabsorber intercooler and various other minor cooling duties required in the power and distillation unit equipment. The raw-water supply is also connected to the plant camp and to all fire systems.

IMPOSSIBLE ?



OF course it's impossible. Nobody but a gremlin could have put the arrow through that block of wood, because the ends are bigger than the hole. But there it is, an accomplished fact—and there's a perfectly simple explanation for it.

Ten years ago the rayon people handed Taylor the problem of temperature control for rayon shredders. They said they didn't believe it could be done, but we could try. So Taylor Engineers accepted the challenge, designed an appropriate temperature-sensitive bulb and developed a new control effect now known as Pre-Act. This new effect, based on *rate* of temperature change, provided the accurate control demanded despite the difficult process conditions.

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Use of Materials in Secondary Recovery

by Paul D. Torrey

INFORMATION now available shows a secondary reserve in excess of 4,000 million barrels, a volume of crude greater than the total past production of quite a few of the important oil states. This figure does not include a probable enormous secondary reserve existing in many of the older fields in the State of California, where primary recovery efficiency appears to have been quite low in comparison to fields producing from formations of similar geologic age in Louisiana and Texas. Inferior primary recovery efficiency is one good criterion of conditions favorable for the application of secondary-recovery methods. Excellent primary recovery efficiency is indicative of poor secondary-recovery possibilities because of a low residual oil content remaining in the reservoir after the primary production phase has passed.

In giving consideration to the availability of secondary oil reserves as an assistance to the war effort, it should be kept in mind that only about 40 per cent of the presently estimated secondary reserve of the United States can be produced profitably under existing crude-price schedules. The necessity for an increase in crude price to prevent the abandonment of literally thousands of stripper wells, to stimulate the rate of exploration for new fields, and to encourage the more intensive development of new fields producing from deep formations, has been emphasized time and again by the leading petroleum authorities of the nation. A general increase in crude price would make possible the profitable development of secondary-recovery operations in many thin sand and deep fields, some of which are now in various stages of abandonment. Secondary-recovery operations generally are so flexible that increased production of oil may be secured at a rate comparable to the development of production in a new field. Thus, the secondary reserve should be given the same consideration as the primary reserve, subject to the limitations of price, in the formulation of plans for providing for the extraordinary requirements for petroleum and its products brought about by the belligerent status of the United States.

It should be pointed out that the known secondary oil reserve occurs in large part in the older fields whose productive boundaries have been established by drilling years ago. Consequently, in fields adapted to the application of secondary-recovery methods, no costly exploration and leasing programs, and no wildcat drilling are required. With proper technical guidance, the risk involved in the development of secondary-recovery projects is very low. Therefore, in areas where oil is needed in large quantity for the offense against our enemies, it is possible that the supply required can be made available generally in a much shorter time period than might be required for the discovery and development of new primary production. Furthermore, since the quality of crude occurring in fields adapted to secondary-recovery methods may be determined in advance of any intensive development, the refiner may have the choice of procuring a grade of oil which will conform to its manufacturing system and to the quality and type of products desired.

ABSTRACT

Large but little-recognized secondary reserves exist in the United States which are available to augment the primary reserves. The development of the secondary reserves usually involves a minimum of new materials, it frequently being possible to utilize existing production facilities and wells.

Percentage increases in production from secondary-recovery operations correspond to the increase in production brought about by the active development of a new field.

Prevention of corrosion in both gas-repressuring and water-flooding operations will serve to eliminate frequent replacements of equipment and thereby will provide substantial savings in new materials.

The successful application of flowing methods in water-flooding operations eliminates the need for all surface and subsurface equipment commonly required to lift oil to the surface.

Unitization can provide savings in material and in operating expense by reduction in the number of plants and pipe lines.

This article was delivered as a paper at the Wartime Conference of the southwestern district, A.P.I. Division of Production, Houston, Tex., April 29-30.

Shortage Dictates Allocation

The continued reduction in the quantity of materials available to the petroleum industry cannot help but be appreciated by anyone engaged in the drilling and completion of wells. Oil is needed abundantly and at strategic locations where the demand or the particular quality of the crude produced requires a greater allocation of the limited amount of materials now available. It is notable that many secondary-recovery operations can be developed in large part by the utilization of existing production facilities. Old wells can be rehabilitated and surface machinery and equipment repaired. Because of the general shallow depth of the fields in which secondary-recovery methods presently can be applied profitably, such new equipment that may be required may be of the lowest grades of steel. Salvaged equipment from other properties and fields and second-hand materials usually can be employed successfully. Thus, increased oil production may be secured with a minimum of new materials thereby providing a partial accomplishment of the program for more oil with less steel. Mention, also, should be made of the apparent waste of materials involved in the drilling of many closely spaced inside locations in older fields when the same results in desired increase in production might be secured with practically no new drilling by the application of secondary-recovery methods. In this connection it will be recognized that the maintenance of reservoir pressure will be found generally to be more feasible and certainly more economical than the restoration of reservoir pressure. Therefore, the possibilities for the artificial injection of gas or water, even into recently discovered reservoirs, should be given immediate consideration in fields where poor primary recovery efficiency may be indicated. The methods developed in secondary-recovery operations over a long period of years for the injection of fluids into oil-bearing formations may prove to be valuable guides for this purpose. These methods are described in great detail in the book entitled "Secondary Recovery of Oil in the United States," compiled by the standing subcommittee on secondary-recovery methods, and published by the American Petroleum Institute in November 1942.

The development of gas-repressuring projects usually requires less new materials than are required for water-

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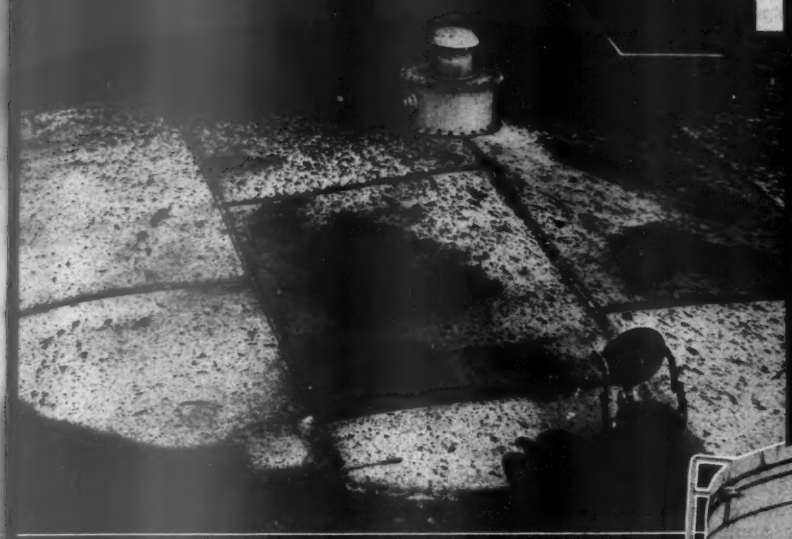

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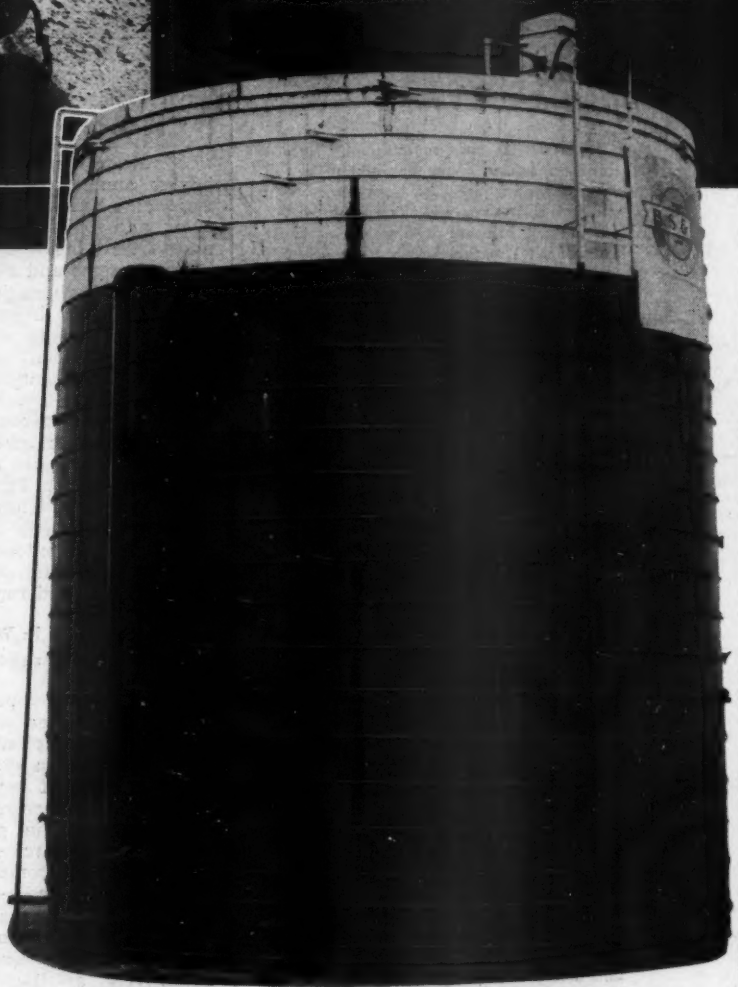

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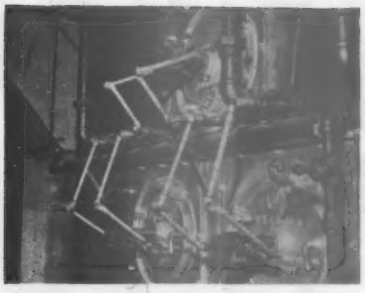

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flooding operations on account of the wider spacing of wells generally employed. Therefore, substantially increased production may be obtained with little or no new drilling. Additional equipment required may consist of compressors, distribution and gathering pipe-line systems, motors and surface connections, and equipment necessary for the proper regulation of gas injection. The tubing and pumping equipment already in the wells, even if only in fair condition, may be utilized, and the only additional subsurface equipment that may be required for injection wells may be packers and possibly flow valves in producing wells if the use of gas lift is contemplated.

Compressors used for the extraction of natural gasoline frequently can be converted at low cost for injection purposes. Many smaller installations use belt-driven compressors, the motive power being obtained from the engine connected to a central power. Loop pipe-line systems for the gathering and distribution of gas afford material savings in line pipe over radial systems and may be employed to advantage where there are no great variations in injection pressures. Measures taken to prevent corrosion of equipment will result in a low rate of replacement of equipment and will reduce the loss of production resulting from breakdowns. This is of particular importance where air or air-gas mixtures are employed as the injection medium. Protective coatings on pipe and a simple dehydration system may serve to preserve the lines over an extended period and thus eliminate the necessity for frequent repairs and replacements.

Materials Used in Water-Flooding Operations

Water-flooding operations require a source of water supply, generally a water-treating plant, pumps, and a water distribution system. Usually a larger number of both injection and producing wells are required than are used commonly in gas repressuring projects. The greater development cost usually is compensated for by more complete and rapid recovery of oil, although some authorities have expressed the opinion that if gas injection projects were developed as extensively as the average water-flooding operation comparable results would be obtained.

The prevention of corrosion of equipment is one of the principal problems in the conservation of materials in water-flooding operations. This is of particular importance where salt water from underground sources is used as the injection medium. Another cause of corrosion is dissolved oxygen and carbon dioxide in the water. Some methods frequently employed for combating corrosion are: The use of noncorrosive pipe and sucker rods, a costly method and one now almost impossible to employ because of the scarcity of alloy steels; the use of cement-lined pipe, the precipitation of an interior protective coating on the pipe by chemical means; decreasing the acidity of the water by chemical action; degasification of the water; and handling the water in a completely closed system so that no gases are absorbed from the air. These methods are used sometimes singly and in other operations in various combinations depending on the problem peculiar to the particular operation and to the scope of development.

A very promising, fairly recent development in water-flooding operations is the flowing of production instead of the pumping of wells. In this method, back pressure is held on the oil wells and the pressure in the reservoir is allowed to build up, by the action of the water-injection pumps, to a point where the wells will flow. No surface pumping equipment for lifting the oil is required, resulting in a substantial saving in both surface and subsurface production equipment, and protected pipe for the control of corrosion may be used throughout the entire system because of the elimination of moving sucker rods and working barrels in the producing wells. Production costs are reduced on account of the elimination of the need for periodic repair of pumping equipment, and the recovery results so far obtained indicate an equal if not greater recovery in comparison with that obtained by conventional pumping methods.

Unitization of Secondary-Recovery Operations to Save Materials

Unitization of groups of properties or an entire field may afford great savings in materials and in operating expense by the elimination of multiple compression or pumping plants, and distribution and gathering systems. The development of a common source of gas or water supply can provide easily recognized reductions in development cost and operating expense.

Much has been written regarding the merits of unitization of oil fields during the primary production phase. The same benefits will prevail in secondary-recovery operations, and in addition proper recognition can be given to the ownership of oil in place in the reservoir rather than when possessed and brought to the surface. By giving consideration to the reserve of residual oil underlying each property rather than to the surface area involved, the disparity in the quality of individual holdings which exists in almost every oil field, is given proper emphasis in the formulation of the unitization agreement, with the result that each operator will receive his equitable percentage of the recoverable residual oil content of the reservoir.

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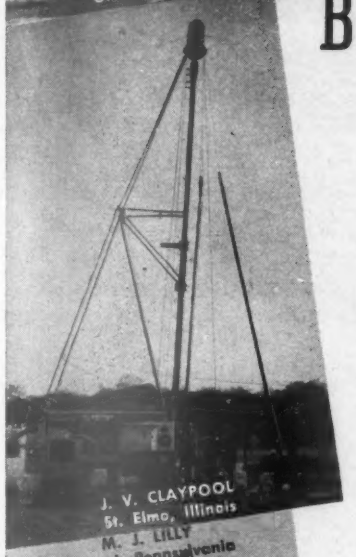
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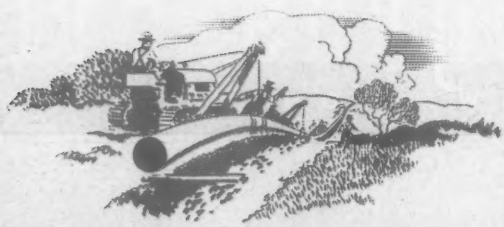
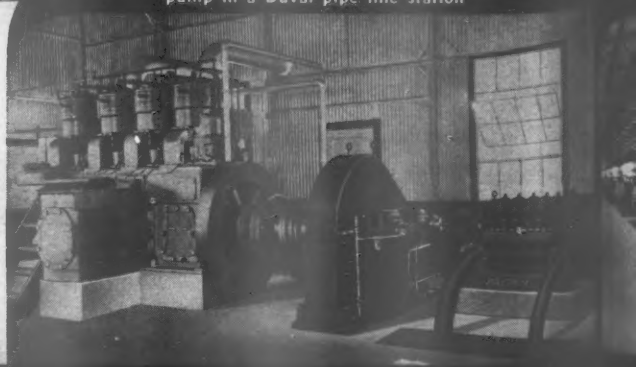
Four 6-cyl., 600 H. P. Clark "Angles", Canadian River Gas Co. pipe line station

Clark 400 H. P. "Angle" driving oil pump in a Duval pipe line station





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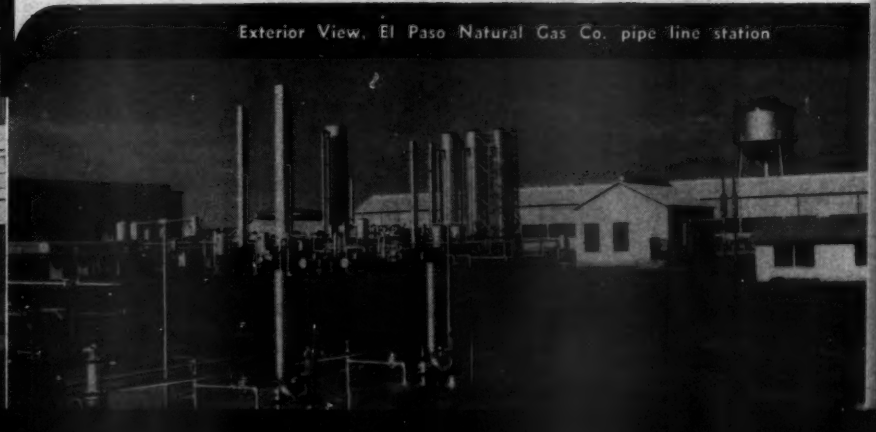
600 H. P. "Angles" in an El Paso Natural Gas Co. pipe line station

Exterior View, El Paso Natural Gas Co. pipe line station



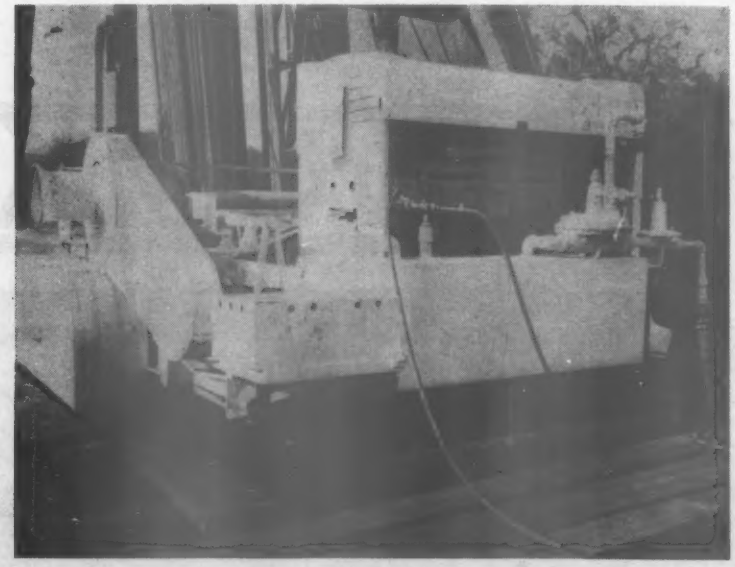
OPERATING IDEAS

Sample Catcher in Mud-Return Line

THE mud-return line of a rig operating in Kansas has been provided with a side trap for catching samples. The return line from the well to the pits consists of a half section of 8⅝-in. pipe cut open lengthwise. The velocity of the mud stream in this "ditch" is so great that taking of samples from or at the outlet end of it is difficult. The sample catcher consists of a short section of the top half of the 8⅝-in. pipe which was cut off to make the return line. This section is welded to the side of the return line at the lower end with open side up. The back end was closed with a welded plate, and a small opening was cut in the side from the mud-return line. Through this opening a portion of the mud stream is bypassed into the catcher. A small gate at the outlet end of the catcher retains bypassed stream and cuttings in trap until desired.

Rear Support for Service Truck Prolongs Life of the Unit

THE addition of a relatively simple member below the rear end of the steel bed on a service truck adds much to the life of the unit. Welded to the lower arc of the section of 6-in. pipe forming the rear of the truck bed, two pedestals carry a second heavy crossmember at approximately axle level. This lower member protects axle and tires when backing in for a load, the horizontal member serves as step for the maintenance crew, and the unit permits proper blocking of the truck when picking up a heavy load. Instead of relying on truck weight to prevent overturning, or undue concentration of load on the rear tires, two short jacks are placed under the pedestals of the unit and adjusted until they, through the rear end of the truck bed, carry most of the load until the cargo is dragged on and properly located on the broad platform. When using jacks for this purpose, the only precaution necessary is to insure that sufficient adjustment is provided to allow them to be lowered until the springs assume the entire load. Jacks for supporting the rear member are carried in one of the two tool boxes on the truck, and have auxiliary pads or footings to give proper base when used in sand or loose soil.



Battery Protection on Rig

PROTECTION of the starting and lighting battery on a slim-hole drilling rig operating in South Texas is obtained by extending the engine skid far enough to carry a platform on which the batteries are ranged and connected in proper order. This platform is equipped with flanged sides so as to guard against damage to the battery cover itself, which is a light steel boxlike unit, high enough to allow a minimum of 1½-in. clearance over the battery terminals, and heavy enough to withstand impact of falling tools or slapping lines. The outer edge of the cover is turned over to engage with the lip formed on the platform. The cover is hooked over this lip first, then carried down over the batteries, being held in place with a pair of hood catches, salvaged from an old auto hood. Ventilating holes, cut through the sheet-metal sides just under the flat roof, provide for the escape of gases generated by the batteries during service.

"It takes Marsh to build a gauge that will stand up!"

AN operating man said that, and he expressed what hundreds of other practical men have found out about gauges, namely this:

When gauges are new they look a good deal alike, and when they first go into service they work a good deal alike. But under the punishment of daily service you'll find that MARSH Gauges begin to stand out as the kind that can take it and still maintain their original accuracy.

The fact is that it's comparatively easy to make a gauge that will start out accurate, but it takes the knowing design, the careful testing of materials, and the painstaking workmanship taught by 75 years of Marsh specialization, to make a gauge that will *stay* accurate.

And Marsh Gauges not only possess more stamina; they also have the Marsh "RECALIBRATOR"—the only basically sound way to restore accuracy in a gauge when it is thrown out of adjustment by overload or severe shock.

The good attributes of Marsh Gauges, including the "Recalibrator", are found in Marsh Dial Thermometers. There is a Marsh Gauge, Thermometer, or Recorder for practically every pressure or temperature measurement requirement.

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Day by day, oil becomes ammunition more than ever—and in brand new ways. All those products of petroleum are *weapons* today. ***But our salute is to the people who build and wield those weapons.***

- to the thousands of men and women from the industry fighting in our armed forces (more than a thousand from the Pure Oil Company alone).
- to the thousands fighting research, production, and transportation battles here at home.
- to the patriotic earners putting 10% of their income in War Bonds . . . (more than 90% of all Pure Oil employees!)
- to the men who've given their lives—and to their buddies who grin and go bravely on giving *their* lives—manning tankers.
- to the courageous distributors and dealers—Pure Oil's own distributors and dealers among them—sticking to their guns in spite of reduced help and reduced income, to keep America's war-vital wheels rolling here at home.

THE PURE OIL COMPANY SALUTES THEM ALL . . .

THE PURE OIL COMPANY, U.S.A. PURE

PROGRESS IN METALS

by W. L. Nelson

New High-Temperature Alloys of Columbium And Iron

ALTHOUGH columbium has long been used with carbon in the chromium and chromium-nickel stainless steels, the use of columbium alone for replacing carbides is a new development. The need of the refining industry for a low alloy high-temperature steel is urgent—and it is quite possible that columbium-iron alloys may fill this need.

Abstract—D. W. Rudorff, Columbium in High Temperature Steel, Metallurgia, Vol. 26, pp. 193-96, 224, Oct. 1942. Taken from Metals & Alloys, p. 186, Jan. 1943.

In recent investigations, E. R. Parker has found that certain intermetallic compounds are more stable at high temperature than carbides; and that alloys containing precipitates of such compounds possess a greater resistance to deformation and fracture than commercial alloys, relying upon carbides for their strength. His experiments with a 3 per cent Cb, 97 per cent Fe alloy are noteworthy. Similar investigations in Germany have resulted in the development of low alloyed columbium steels for high-temperature service.

Hardening by Quenching

Iron-columbium alloys with more than 0.5 per cent Cb can be hardened by quenching from high temperatures and subsequent tempering, because the solubility of the intermetallic compound formed increases with rising temperature. Tests with an alloy containing 1.9 per cent Cb show that hardness rises steeply from 900° C. (1,652° F.) and declines at temperatures exceeding 1,150° C. (2,102° F.). This is due to the different solubilities of columbium in the gamma-phase and the alpha-mixed crystal and in the gamma-alpha transformation after quenching, and the fact that at 1,150° C. (2,102° F.) the alloy enters the delta-phase and that the homogeneous delta-mixed crystal is not subject to transformation during quenching to room temperature.

In testing the influence of the temperature of draw upon the hardness with various temperatures of quench, it was found that the optimum precipitation temperature lies between 600° and 650° C. (1,112° and 1,202° F.) and that a 1,300° C. (2,372° F.) quench obtains the greatest hardness.

This property of columbium finds extensive employment in stainless chromium-nickel steels where its addition reduces the danger of intercrystalline corrosion. It can also be used to reduce the hardness of chromium steels which must not be hardenable. Columbium, to eight times the carbon constant, is required for combining the carbon content.

With a steel containing 0.13 per cent C and 1.04 per cent Cb, the hardness can be increased from 87 to 99 Brinell with quenching from 1,100° C. (2,012° F.). Quenching from 1,200° or 1,250° C. (2,192° or 2,282° F.) shows still greater hardness. Columbium carbides brought into solution at high temperature are precipitated only with the temperature of draw exceeding 500° C. (932° F.). Decrease in hardness occurs only when a temperature of 650° C. (1,202° F.) is exceeded.

Columbium-Carbon Ratios

This high resistance to tempering can also be produced with steels in which the columbium percentage is more than eight times that of the carbon. When the columbium carbon ratio exceeds 8:1, the creep strength shows a rapid rise, due to the existence of the intermetallic compound of iron-columbium in addition to the columbium carbide.

Impact strength rises with tempers at 550° C. (1,022° F.) and higher but above 550° C., creep strength rapidly decreases. Increased yield point and creep strength, therefore, must be purchased at the expense of notched-bar impact strength. Impact tests on plain bars without notch showed good impact values.

The same heat treatment can be applied to alloyed steels if the columbium content is higher than eight times the carbon percentage.

Additions of columbium, with columbium more than eight times greater than carbon, to austenitic high temperature resistant steels, results in improvement of creep strength. Addition of columbium beyond a certain upper limit effects changes in the structure of highly alloyed chromium-nickel steels. Restitution can be effected only by increasing the nickel content. Existence of the critical 8:1 ratio was also found in the case of rolled material not subjected to heat treatment.

Creep Characteristics

Any increase in columbium above 2 per cent is useless as it will not be accompanied by further improvement in creep strength. Less than 2 per cent permits the use of high quenching temperatures without producing the delta-crystallites. A reduction in columbium content to 1 per cent will not effect a reduction in creep strength, provided the carbon content is also reduced to the greatest possible extent. The favorable influence of increased carbon content in steels containing 2 per cent Cb and more is solely due to the fact that it tends to shift the gamma-delta transformation to higher temperature ranges.

Minimum permissible columbium content lies between 0.5-0.7 per cent. Erratic decreases in creep strength in steels containing less than 0.5 per cent Cb showed that the beneficial effect of the intermetallic compound was negatived by some factor which was finally found to be the sulfur content. A reduction of sulfur to 0.01 per cent, which may be achieved by special methods, results in only a slight reduction in the creep strength qualities.

Metal-Working Terms

Lapping

Lapping is a highly refined process of grinding which is used for correcting minute errors, for producing extremely smooth surfaces or for reducing sizes a very small amount. The abrasives used are fine-grained varieties and are applied in dust-like form between the work and a piece of softer metal called a lap which is oscillated and reciprocated as the work revolves. The lap usually has a serrated or notched surface so that bits of the abrasive are loosely caught and pushed over the surface of the work. A common example is the grinding of automobile engine valves by rotating the hard valve against the cast-iron seat using an abrasive between the two surfaces. In this case the cast-iron seat acts as the lap.

Removal of Paraffin Accumulations In the University Field

by Benjamin C. Craft and R. F. Nichols†*

A new paraffin scraper is described which has resulted in a substantial reduction in scraping time. This tool has been used in the University oil field where it is good practice to scrape each well twice weekly. It is believed that the tool may also be used successfully on wells produced by a surface-controlled gas-lift system. This article was delivered as a paper at the Wartime Conference of the southwestern district, A.P.I. Division of Production, Houston, Tex., April 29-30.

THE producer of crude oil, faced with the problem of profitably operating his properties under restricted economic and manpower conditions, recognizes the importance of reducing lifting costs to a minimum. The accumulation of paraffin within the tubing of wells producing paraffin or mixed-base crude constitutes a serious production problem, and greatly increases the lifting cost.

The many factors effecting the separation of paraffin from crude oil have been discussed in detail,[1] and the various methods of removal have been recently reviewed.[2,3,4,5] These papers point out that the mechanical removal of paraffin in flowing wells has proved effective in most major production districts. The tools used in most fields are a small cable-tool outfit consisting of a wire-line socket, sinker, bar, jars, and cutter or scraper.

The common types of wire-line scraping tools are the slip-ring scraper or hook, rotating cutter, ring cutter, spur cutter, and wire brush. Of these the most popular seems to be the ring cutter, also called the circular cutter or biscuit cutter.

Formation of Paraffin

One of the first production problems in the University oil field was the formation of paraffin in the tubing, well-head connections, and flow lines. It was found that flow-line pressures could be reduced either by the use of solvents, steaming, or heating the line in a shallow bell hole. Analysis of conditions responsible for the heavy deposits in the tubing, starting at 2,500 ft., failed to develop production practices which would minimize the paraffin problem. The only possible solution seemed to lie in high rates of flow or stopcocking, but these were not practical since the field is under an active water drive.

The first scraper used was the regular short-shank ring or circular cutter. This cutter had a serious defect. It was easily plugged with paraffin, and lifted up the hole by the well stream, and then dropped, which resulted in a number of serious fishing jobs. In addition it was not uncommon to require 2 to 3 hours scraping on each well, and on weak wells large chunks of paraffin would plug the choke, killing the well.

The first improvement was the development of a long-shank circular cutter with 12-in. shanks, 1 in. wide. The knife was 2 7/32 in. o.d., and 1¾ in. i.d., and 1¼ in. long. The wide opening on each of the shanks eliminated plugging and resulted in faster cutting, but the tool still had the disadvantages of the removal of large chunks of paraffin and long cutting times which might have been shortened by reducing the knife thickness to ⅛ in.

To overcome these last objections the new knife illustrated in Fig. 1 was developed. The body consists of a ⅝-in. cold-rolled steel shaft which is drilled with 3/32-in. holes for the wires and tapped at right angles for Allen set screws. The scratchers were made from 0.092-in. diameter mild plow-steel wire, cut 2¼ in. long for 2½-in. tubing. The two semicircular knives at the top are made of spring steel, are sharpened on top and bottom edges, and provide an open passage for the flow of cut paraffin and well fluid. For 2½-in. tubing the knives are 2¼ in. in diameter and may be either welded or bolted to the steel bar.

This tool eliminates all the undesirable features of the circular knife or biscuit cutter. The scratchers loosen and break the paraffin into small chunks from the wall of the tubing and any accumulations remaining are removed by the overlapping circular knives. The paraffin is then, even at low rates of flow, carried up the tub-

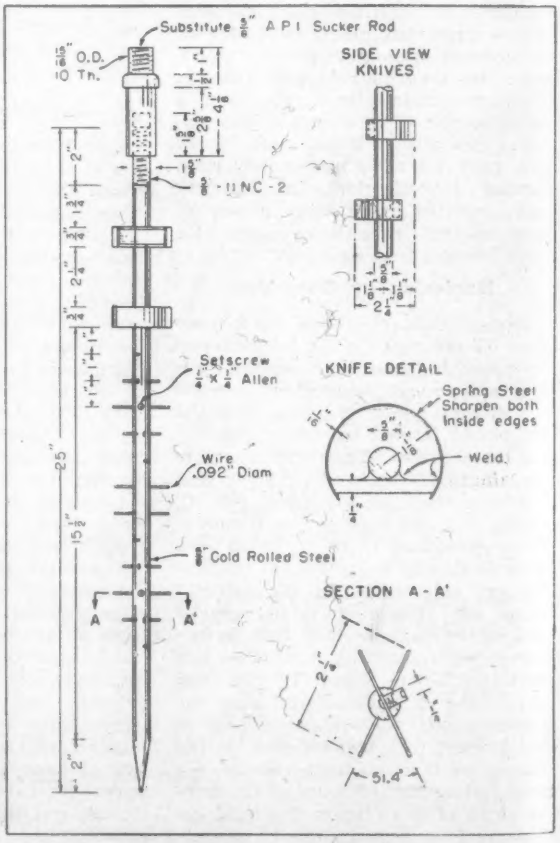
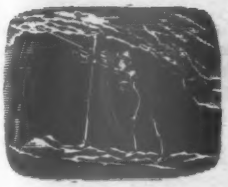


Fig. 1—New type of wire-line paraffin cutter

*Department of Petroleum Engineering and Engineering Experiment Station, Louisiana State University, University, La.
†Superintendent, Grubb and Hawkins, Baton Rouge, La.



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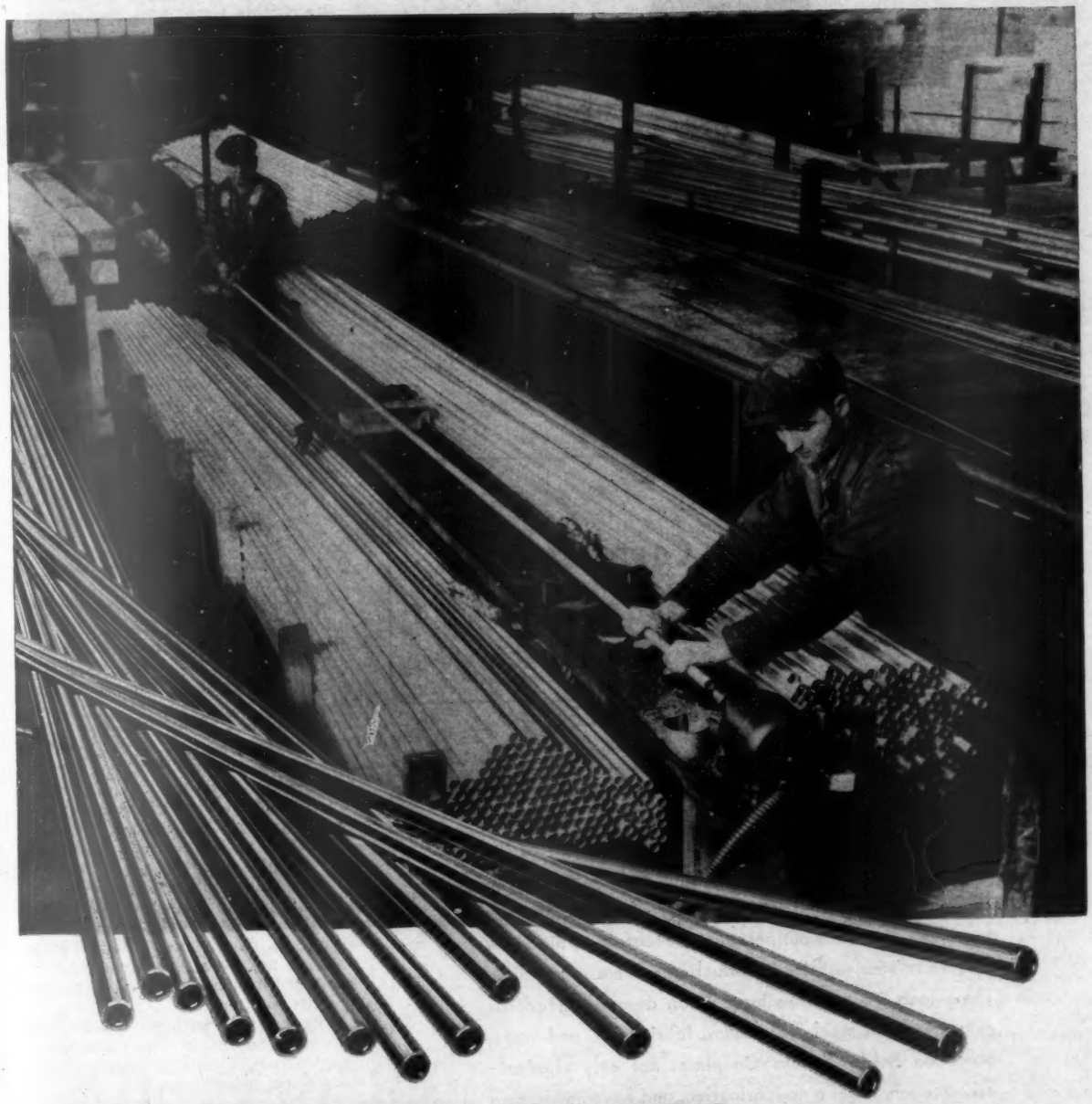

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ing, with no danger of plugging the choke. It is believed that the combination of knives and scratchers more effectively cleans the tubing than the circular cutter, which leaves a thin layer of packed paraffin on the inside of the tubing. Wells after being scraped with the latter always cut harder than usual with the scratcher. The cutting times with the improved circular knife and the new tool are given in Table 1, which shows an average reduction of time on six wells of 72 per cent. Disregarding well No. 4, which cut rather easily with both knives, the average reduction was 77 per cent. With most operators in the field it is standard practice to scrape each well twice a week, although one operator scrapes every other day. It is considered good practice to place wells operating with automatic flow valves on a small choke to prevent heading while being scraped.

TABLE 1
Comparison of Scraping Time for Wells in the University Field

Well No.	Time to 2,500 ft. with circular cutter	Time to 2,500 ft. with scratcher	Reduction in scraping time	Per cent reduction
1	31′ 10″	6′ 7″	25′ 3″	80.5
2	26′ 40″	6′ 5″	20′ 35″	77.0
3	17′ 55″	6′ 30″	11′ 25″	63.8
4	9′ 55″	5′ 20″	4′ 35″	46.3
5	38′ 50″	9′ 40″	29′ 10″	75.0
6	64′ 35″	7′ 0″	57′ 35″	89.1

If the average reduction in cutting time of 75 per cent is applied to the East Texas field, where during 1939 a total of 4,791 wells were scraped by eight companies with an average of 146 minutes per well, there would result a saving of 8,743 hours.

Conclusions

The paraffin problem has not been eliminated in the University field; however, its removal represents a small part of the lifting cost. This has been made possible by the use of improved wire-line scraping equipment and the scraping of wells at uniform intervals. It is believed that this equipment will prove economical in other fields where severe paraffin problems exist and it is suggested that the new scraper be tried on wells produced under the surface-controlled gas-lift system.

The authors wish to acknowledge the cooperation of the operators in the University field for supplying information for this paper.

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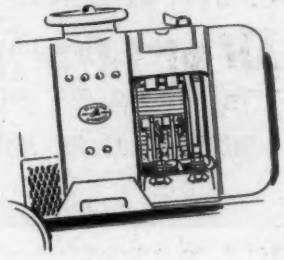

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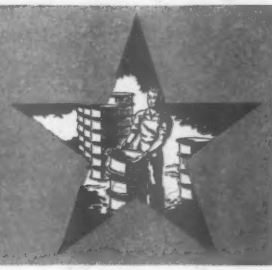

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Direct-Current Rigs for Deep Drilling Operations

by R. A. J. Dawson *

Despite the difficulties that have attended the operation of direct-current rigs in the past, the author considers that they have a very definite role in drilling operations. The essential features of rigs of this type are outlined in this article which was presented before the Wartime Conference of southwestern district, A.P.I. Division of Production, Houston, Tex., April 29-30.

INTEGRAL oil-well drilling rigs may be divided into two general classes, those that are steam-powered, and those deriving their original power from internal-combustion engines. The generic term **power rig** is usually applied to all rigs other than those powered by steam.

Power drilling, in the usual sense, means drilling performed by the use of internal-combustion prime movers, and the term **power drive** refers to the mechanism that accomplishes the power transfer.

Direct-drive power rigs are those that use internal-combustion engines or other prime movers to drive the drilling machinery through either mechanical or fluid transmissions.

Electric rigs have both electrical generators and electrical motive equipment effecting the power transfer between the original prime mover and the drilling machinery.

History and Discussion

It appears that portable internal-combustion direct-drive drilling rigs have forecast the doom of steam rigs down to 5,000 ft., except in instances of predictable work favorable to steam. This is due not only to the multiple field advantages of the small portable direct-drive rigs, but also because such rigs have an initial cost comparable to that of steam for the same depth range. In the depth range from 5,000 to 11,000 ft. only an accurate analysis of predictable work justifies the purchase of equipment types. At the present time, fuel cost seems to be the dominant factor over flexibility, portability, water cost, etc. In proven-field use the gas-fired steam rig is still preferable, but in isolated areas steam is steadily giving way to power. . . .

. . . At the present time no means of direct-drive gives promise of having the necessary characteristics to handle the enormous loads imposed upon equipment in drilling below 11,000 ft. in competition with steam power. It is also doubtful that the necessary hairline power distribution can be had in the near future with direct-drive unless the price of the mechanical equipment skyrockets. Large direct-drive rigs being designed today have a cost comparable to that of electric rigs but still lack the flexibility so necessary in deep operations. A recent trend in the construction of direct-drive rigs is to place the prime movers behind the draw works and to drive the pumps off the same transmission which drives the draw works. The complexity of direct-drive hoisting machinery has reached the point where the draw-works unit alone costs over $55,000, more than twice the cost of a 10-in. unit either for electric or steam drive. Even with more complicated speed reduction than is practiced today on direct-drive rigs it will not be possible to approach the over-all efficiency of both slush pumps and draw works that is easily accomplished with electric drive.

Attention should be called to the fact that if heavy drill strings are to be hoisted, at least 1,000 hp. must be concentrated behind the draw work on direct-drive designs. Although this concentration of power may effect some sort of draw-works drive, simultaneous operation of heavy slush pumps will be undeniably related to both the power and speed demands of the draw works. The location of several large engines behind the draw works not only poses great alignment, movement, maintenance, control and fire-hazard problems, but also dictates rig layout and derrick substructure height to a very restrictive degree. Only by the addition of large costly fluid transmissions will pumping equipment on direct-drive rigs ever realize the creeping speeds easily obtainable with direct-current motor drive.

There are at present two systems of electric drilling being used, the alternating-current installations being outnumbered by the direct-current rigs as far as the heavier rigs are concerned. The alternating-current rigs have proven their ability to drill deep wells, and have done so with equipment not designed for such heavy duty. Because of inherent characteristics, this system does not have the flexibility, overall economy, or potentialities of the direct-current method. This paper is concerned with the usage of direct-current machinery because it has already proven itself to be an unusually efficient and economical power medium.

Competitive Field Limited

Electric rigs can enter upon competition with other rigs in shallow areas only in certain instances, and their comparative cost prevents their wide adoption for shallow-to-medium depth wells. Naturally a major company could be assured of enough future specific locations so that it could make the most economical choice of power, but the same assurance is seldom found among the smaller operators and the contractors.

It is very important that direct-current power be fully understood before ever attempting to fit it into drilling schedules from 5,000 to 11,000 ft. There is always the possibility that future improvements of direct drives may enable them to replace other types of power transmission down to 11,000 ft., but beneath that depth, electric power affords a load

*Office of Petroleum Administration for War, Washington, D. C. Formerly employed with the Texas Co.; Freeport Sulphur Co.; Gulf Refining Corp, Production Division; Hope Drilling Co.; Stanolind Oil & Gas Co.; Strake Petroleum Corp., and O. W. Dyer Senior and Junior Drilling Contractors. The author's title of this article is "Construction and Economic Significance of Direct-Current Rigs for Deep Drilling Operations." Portions of the "History and Discussion" have been omitted.

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distribution more inherently advantageous than other power drives. . . .

. . . The usual case history of the direct-current rig is that soon after delivery it was called upon to perform tasks all out of reason with respect to its designed rating. Electric rigs, properly designed, have a great reserve capacity for their tailor-made work, but a small electric machine is never sympathetic to overloading. The fact that steam equipment is naturally flexible has tended to obscure the fact that electric equipment must be especially matched to its most optimum type of work. Only during the last several years have full electric rigs been designed and constructed to handle easily the loads necessary below 11,000 ft. in competitive drilling under all circumstances, and the performance of these larger rigs can be best judged by a few statistics.

On a water location 16 miles from the supply dock, a full electric direct-current rig made 12,913 ft. of hole in only 60 drilling days. This depth was made with 4½-in. 16.60-lb. drill pipe, which was pulled on the last trip in the fast time of 3 hours and 55 minutes, with no especial attempt being made to shorten pulling time.

It is interesting to note that the above time was made with a 7-year-old, three-shaft, four-speed, 8-in. draw works that was not even oil-bathed. With an improved hoisting set up, even better time would have been made, but 14,000 ft. of 4½-in. drill pipe could have been handled with this unit provided that its lubrication system had been improved and the proper hoisting speeds maintained. Given sufficient design, prime-mover horsepower, and electric power, direct-current rigs can compete economically with steam to depths of 15,000 ft., provided that these rigs be accorded proper maintenance and well supervision. . . .

. . . Thus far, only four drilling rigs using direct-current power have been built that could easily compete economically with steam rigs to depths beyond 11,000 ft., but the performance of these rigs has plainly indicated the many advantages of electric power for the deep wildcats of the future.

Advantages and Disadvantages of D.C. and Steam Rigs

A. Advantages:

1. Fuel cost. (Average on 11,000 plus depths.)

Electric rigs.

Diesel—$35 per day fuel and oils.
Butane—$140 per day fuel and oils.
Gasoline—$155 per day fuel and oils.
Gas—$4 to $12 for 90,000 cu. ft. daily, plus oil, etc.

Steam rigs of equal size.

Fuel oil—$260 per day.
Gas—$60 to $180 per day for 1,200,000 cu. ft. per day.

2. Water cost.

Electric.

Average about 150 bbl. day, seldom over 500 bbl. per day with use of waste water washdown pump.

Steam.

Use about 600 to 800 bbl. per day makeup water with condensers.

Without condensers use from 2,000 to 3,500 bbl. per day.

3. No steam lines or remotely controlled water supply.

4. Speed and torque of all units are obvious.

5. Less vibration of hoisting units.

6. More electric and flexible accessories.

7. Smoother and faster draw-works clutching.

8. Driller has centralized control of all operations.

9. Less fuel-oil haulage or barging.

10. General water supply problem less costly.

11. Motorman able to do floorwork much more safely than fireman, because of synchronized power plant.

B. Disadvantages:

1. High initial cost.

2. General complexity and need of more attention.

3. Need for more intelligent field men.

4. Need of field technical and engineering help.

5. More units to move.

6. Extreme heaviness of pumps. (For large rigs.)

7. Slightly longer rigup time. (For large rigs.)

8. Slightly higher maintenance cost.

9. Inertia action of power pumps. (Have all speed and power variations, but are not as flexible as steam pumps during cementing, squeezing, fishing, sidetracking, stuck pipe, fishing jobs and other quick power variation demands.)

10. Inertia action of rotary. (This factor can be eliminated by electrical control of proper sort.)

Marine Operations

Electrical rigs are especially adaptable to the deep tests drilled in the marshes and shallow bays of the Gulf Coast. Most of the marine electric rigs to date have used separate power barges, but it would easily be possible to incorporate a complete electric rig on one twin-hull, 56 by 150-ft. drilling barge. The power plant could be installed on the upper level directly behind the draw works where it may be easily controlled and maintained. There should be careful protection against fire hazards if this type of construction is used, and it is partly due to the danger of fire that small, separate power barges have been designed. Power barges are usually moored alongside the larger drilling barges, and can be quickly detached and floated away in case of well blowout or fire. Such barges usually contain only the power plant and controls and are usually about 35 ft. wide and not over 60 or 70 ft. long. If separate floating power barges are to be used in open water they should be as large as economically possible, since in rough weather they would be easier to manage. Most of the boiler barges constructed to pair with drilling barges on open-water location are of the submergible type.

If drilling is to be done on piling, or on marsh mats alongside bayous or canals, the power barges may carry the mud tanks, pumps, water pumps, shale shakers, and accessories, in addition to the power plant. Temporary efficient and economical setups such as this may be used in quiet water, all of the equipment being secured to the deck of an ordinary barge.

Although barges of this type are not considered stable enough for rough open-water operations, a unit of this type has drilled the second deepest open-water test, which went to nearly 13,000 ft. In arranging a barge of this type, the power plant placed on one end will balance the heavy mud pumps on the opposite end, while the mud tanks occupy the center of the barge. With this setup the barge maintains an even keel, regardless of the amount of weight of the mud. A complete 1,000-hp. power plant, two 20-in. stroke pumps totaling over 150,000 lb., and two large tanks of heavy mud have been installed on the deck of the barge of 30 by 98-ft. dimensions.

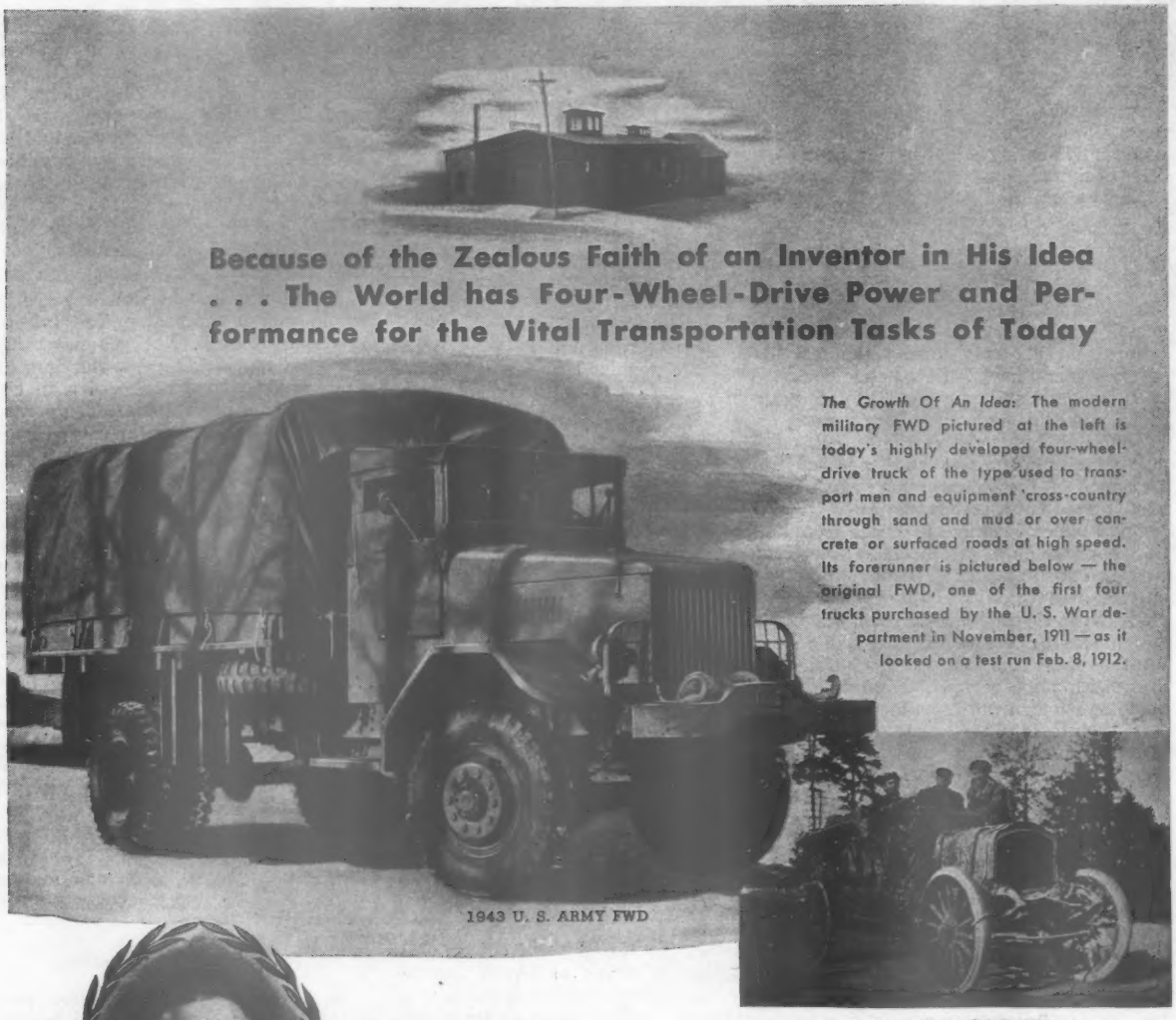
Horsepower Requirements

In referring to comparative performance and construction, it is necessary to fix some total depth to which both electric and steam rigs are to penetrate. In this paper the discussion of all future design and construction is to be based on units capable of competitive drilling to 13,000 ft. with 4½-in. drill pipe and to 15,000 ft. with 3½-in. drill pipe.

To drill to the above depths an electric rig should have at least 1,000-hp. as far as the brake horsepower ratings of its prime movers are concerned. This amount should be available, and is the minimum necessary even if full mechanical and electrical flexibility is obtained.

If electrical drilling is to be done shallower than 11,000 ft., it should be understood that large power rigs are very heavy, and that ones of this size require about 720 man-hours (15 men working for four 12-hour days) in moving from a stacked position to full readiness to drill rathole.

This time assumes a land move onto ready-built derrick of high substructure, with the pump and power plant board mats being already constructed, and is the fastest possible time with all needed traction help.



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1943 U. S. ARMY FWD

1911 U. S. ARMY FWD

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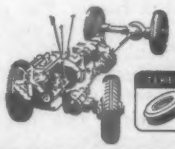

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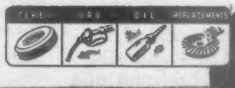

IN EVERY FIELD WHERE TRUCK QUALITY IS PUT TO THE TEST—FWD's STAND UP!

COMMERCIAL

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UTILITIES

OIL FIELDS

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FWD TRUCKS

It is possible to set up a comparative steam rig in about 320 man-hours (15 men working two 12-hour days) under similar circumstances, the units being lighter, and in some respects easier assembled.

Prime-Mover Engines

Regardless of what type of power is used the load should always be divided equally between the prime-mover engines, which should be at least three in number, each being of from 330 to 500 b.hp. With triple units of this kind sufficient power is available to drill with two engines, and the drill pipe may be withdrawn from the hole by a single engine if the well is not deeper than 11,000 ft.

Available oil-field engines range in speed from 400 to 1,200 r.p.m., with their weights being in approximately inverse ratio. Since portability and dependability are both of extreme importance, much thought of future locations should be exercised before selection of type is made. Barge setups are well designed with the simpler, heavy, slow-speed engines, but portability needed for land operations has encouraged the use of the lighter, high-speed machines.

Diesel engines of modified pressure scavenging two-cycle design are now being used for military marine service, giving about 500 hp. at around 1,200 r.p.m. These engines should be ideal for direct connective use plants because of their high horsepower output per pound of weight. They are constructed by a well-known automobile manufacturer, and should, along with other recently designed high-speed diesels, revolutionize oil-field power plants.

Direct-connected generative plants have been used for some time with shallow drilling rigs and the new high-speed diesels will provide sufficient power to do deep drilling. It will be possible to use the accurate construction facilities of the large factories in assembling these large in-line plants, giving units of better bearing and shafting alignment. Moving and rig-up time should be greatly reduced, and the overall efficiency of the power plants greatly increased.

It will be much harder for a clutch-connected direct-drive power rig to use high-speed engines than it will be for a full-electric, direct-current rig to follow the high-speed trend. Clutching troubles will naturally increase at high speed, and with direct-drive power it is impossible to get full engine power unless the motors are up to rated speed. Until torque converters and hydraulic transmissions are made much larger and more efficient, direct-drive rigs will not have the necessary smooth power conversion to do competitive deep drilling.

Transmissions

For purposes of load diversion, balancing, and speed kickup, the V-belt type has proven much better than chain or gear transmissions for drilling operations of the heavy class considered.

Among the important reasons for the efficiency of V-belt transmissions are the following:

1. Positive load design and length of belts.
2. Different spacings possible according to belts used.
3. Low upkeep cost.
4. Long life of large V-belts.
5. Very effective load distribution
6. Absorption of shock loads and thrusts.
7. Ease of construction of transmission.
8. Ease of repair and maintenance.
9. Visibility of system.
10. Simplicity and low initial cost.
11. Ease of lubrication.
12. Lightness and unitization with motors.
13. Correction of small misalignments without harm.
14. Quickly rigged up and torn down.

. . . In constructing any type of electric rig, regardless of size, internal-combustion engines of at least 175-hp. or over should be used, since only engines above this size are sturdy enough to provide dependable power and stand up under the treatment that must be given to all oilfield equipment.

Generating Equipment

In like fashion the generative units should be large enough so that each may accomplish its appointed task without any aid from any of the other electrical equipment of like size.

We are fortunate that electrical equipment of the power output and rotative speed most suitable to our use is of a size that is readily transportable. Generators may be had up to 500 kw. that weigh less than 15,000 lb., and can be easily handled in twin units by medium winch trucks.

Power of the 1,200 r.p.m. generating equipment used in the oil fields has ranged from 150 to 500 kw. and this equipment has in most instances been but slightly modified from the general industrial equipment of like nature. The generator field controls are for the most part adaptations of similar controls used in mining, crushing, hoisting and like operations that demand wide variations in speed and power.

The voltage of available generators and motors ranges from 200 to 400 volts, being limited at the higher figure because of protective insulation design. Some of the lower-voltage machines were used for series compounding, giving good speed characteristics, but resulting in lack of torque flexibility. Compounding has been found not only to be a needless operation but by its inherent nature places restrictions either on voltage or current flexibility, and hence upon speed and torque.

Proper Selection of Voltage and Amperage

Generators for a large electrical rig should be of at least 300 and preferably of 350 volts in order to obtain the proper balance between speed and torque with the generator ratings discussed above. Most of the rigs built for 350-volt operation are designed so that they slightly overrun this voltage figure at high-speed, light-load performance.

Electric motors are limited in power only as they are limited in their capacity to stand heating, a large electric motor being able to stand very heavy armature-current overloads, provided that these currents are not maintained too long. The heat generated must be dissipated, and since this heat is the product of the square of the armature current times the resistance, the current that the motors are able to bear is the limiting factor in the design of the circuit.

The torque of a direct current motor is almost proportional to the armature current, and the fundamental design of the rig must be built around the ultimate torque that the electric motors will have to deliver.

The power output, or time rate of doing work, is the product of the voltage times the amperage; hence, inasmuch as the voltage is directly proportional to speed, the need of high-voltage generators to get sufficient speed into the motor (when possible) is easily seen.

Generator Load Distribution

Because of the wide variance in both speed and torque demands, generators of 350 to 400 voltage at 1,200 r.p.m., and amperages up to 800 to 1,000 at full load, have proven best for heavy-duty drilling rigs. At least three generators, totaling nearly 1,000 kw. are needed for this extreme service, and if possible a fourth generator increasing the power to 1,200 kw. should be procured. A three-generator rig must have at least 1,000 kw. if it is to do deep-well hoisting, and in rigs for this size, units can be best divided into units of 500, 330 and 175 kw.

If four generators are to be used, the following distribution would be found desirable: 500 kw. (hoisting on trips, hole pump while drilling), 330 kw., and two 175 kw. It is possible to withdraw up to 14,000 ft. of 4½ in. drill pipe with a 330-kw. machine, provided the draw-works motor is of sufficient size, but a 500-kw. machine would be much better for steady deep service.

Generator Controls

All of the generators and exciters rotate constantly at 1,200 r.p.m., or other rated speed, the generators (and hence the motors they pair with) are controlled by use of a type of Ward-Leonard oil-immersed generator field control.

This control consists essentially in using the voltage of a small 25-kw. exciter generator to vary the field current in the large generator. A large electric rig should have at least two exciter generators of 25 or more kilowatts, these small machines turning at 1,200 r.p.m. with the remainder of the rotating generative equipment, and constantly putting out 125 volts. These small exciters have a permanently charged field magnet construction, and by means of adjustable throttle resistances these small generators are used to control the large generators and hence the large motors.

The armatures of the large generators and of the large driving motors are simply a closed circuit of heavy copper cables, and the driller controls each individual driving motor by means of the small wire circuit of the generator field. These driving motors can be reversed easily by reversing the field current of the generators, which changes the polarity and flow of the armature current.

Division of Operations in Drilling

The various operations to be performed around any drilling rig can be divided into the following classes:

1. Hoisting and rotating.
2. Running hole pump.
3. Driving accessories.

(a) Running mud-stirring pump.

(b) Running high-pressure water pump.

The best way to distribute this work with three generators is as follows:

Generator and Motor 1: Hoisting and rotating.

Generator and Motor 2: Driving hole pump.

Generator and Motor 3: Driving accessories (in parallel).

If four generators and four driving motors are to be used the optimum distribution of assignments is as follows:

Generator and Motor 1: Hoisting.

Generator and Motor 2: Rotating.

Generator and Motor 3: Driving hole pump.

Generator and Motor 4: Driving accessories (in parallel).

When four generators and four motors are to be used, the rotary should be given a separate drive for the same reasons that this practice is so advantageous on a steam rig. If the rotary driving motor be of sufficient size it can serve as an auxiliary unit; in case of failure of the electrical circuit driving the draw works.

Armature-Circuit Transfer Switches

Rather than have a generator able to supply only one of the driving motors with power, it is much better to have the armature circuits correlated so that in case of generator failure, the motor affected could be driven by one of the other generators.

These armature circuits make use of the so-called "common lead" principle, which enables heavier or lighter armature cables to be carried in those sections that have need of such wiring because of current variations. The switches themselves are very large double-pole, double-throw switches fabricated out of heavy bar copper. Single-pole armature switches may be used to accomplish the same result. The compounding features of this type circuit provide for the concentration of multiple generator currents upon the driving motors and afford great power for emergencies.

Protective interlocks, actuated by these transfer switches, are installed in series with the generator fields. These interlocks always break the large generator field circuit in case the switches are pulled, and thus prevent any chance of personnel injury by arcing of heavy currents across the transfer switches. A transfer should never be opened unless the generator fields are zeroed, but by the use of interlocks both the equipment and personnel are protected even if this error is made.

The main advantages of the general design as set out are as follows:

1. Equal load distribution between prime movers.
2. Ability to continue operations with units shut down.
3. Sufficient prime-mover horsepower concentrated in one plant.
4. Rapid assembly of power plant and available power.
5. Constant prime mover and generator speed.
6. Ease of maintenance at rated speed operations.
7. Instantaneous response to load demands.
8. Capacity to withstand shock loads.
9. Flexibility of armature circuits.
10. Full floor control of speed and torque of units.

Ward-Leonard Control Methods

As stated before, it is not possible to have the same degree of automatic electrical control on drilling equipment that is found advantageous in installations where the controls can be better protected and permanently installed.

The Ward-Leonard is essentially a simple rheostatic control of generator field with provision being made for starting, reversing and stopping of this field, in order that the driving motors may also perform these operations.

Starting and reversing features are usually imparted by one of two methods:

1. Location of starting and reversing mechanism within the driller's floor-control rheostat.
2. Location of the above mechanism in the power-plant-exciter control cabinets.

Pumping Equipment

In order to maintain mud pressures of 1,200 to 1,700 lb. per sq. in. and provide sufficient volume, it is necessary to use heavy-duty 20-in.-stroke power pumps. At the present time there are two widely used makes for this type of service, both taking liners up to 7¾ in. in size. On 13,000-ft. wells, these large pumps have given very good service, handling working pressures up to 1,700 lb. per sq. in. with 5½-in. liners, at 40 s.p.m.

The extreme heavy weight of large power pumps is as yet an unsolved bad feature of such pump design. Used with a 400-600-hp. electric driving motor, the 53,500-lb. pump with all accessories weighs over 75,000 lb. The electric motors weigh around 11,000 or 12,000 lb., and must be mounted on adjustable mountings on the extensions of the 12 by 14-in. I-beam pump skids. It is not possible to handle a single unit of 75,000 lb. easily even with our present large tandem trucks, and the motors must be removed from the base extension during rig moves.

Pumps of 20-in. size are run in surface hole up to 54 to 56 s.p.m. with 7¾-in. liners and furnish sufficient fluid to make very fast hole. Throttle controls for the hole pump, the stirring pump, draw works, rotary, etc., are all mounted at the driller's position and he has complete control of the speed and power of all units. Much has been heard to the effect that power pumps will not make hole, but this is not true of well-primed power pumps of modern design.

Pump Drives

It is in the driving of large power pumps that electric drilling motors have their hardest task, inasmuch as the load is heavy for long periods of time. Constant high torque requires high amperages, and the heat developed must not be so great that it cannot be effectively dissipated by the cooling blast from the blower. In a 400-600-hp., 1,000 r.p.m., 350-volt motor it is not advisable to attempt to carry more than 1,000 amp. in driving hole pumps. Since at deep depths the pump motors are naturally running slower, the voltage is a great deal lower than under high-speed, light-load conditions.

Large electric-drive power pumps are not as flexible as steam pumps of comparable size, but the degree of flexibility is much greater than that which is obtained with direct-drive pumps. Relief valves must be used to prevent damage to water-end castings and to safeguard personnel when abrupt stoppages of circulation result. Because of the powerful electric motors used, it is possible to run a

unit of this sort at very slow speeds, and such units may be stalled for long periods without damage provided the throttle is not wide open. Direct-drive power pumps cannot be stalled, and the greater flexibility of electric drive is much better adapted to pumping down cement plugs and similar operations, where shearing of relief valves is best avoided.

It has been proven to the satisfaction of most field-experienced electrical engineers that electric motors of under 300 hp. should not be used to drive the heavy pumps necessary in operations below 11,000 ft. In drilling to extreme depths at least 400-hp. motors are needed and larger sizes would doubtless prove their worth in competitive drilling.

An efficient and economical combination for use in drilling to 11,000 ft. is 300-hp. electric driving motors and high-pressure power pumps of 18-in. stroke. An important advantage of this combination is its comparative lightness, and the total weight of both pump and motor is such that the unit can still be handled by large tandem trucks.

OPERATIONAL CYCLE TABLES

(Using 350-volt, 330-kw. generator and 350-volt, 400-hp. motor)

Hoisting From 13,000 ft. (Total Time, 110 Seconds)

Operation—	Starting	Hoisting	Breaking out	Standing back	Falling block, etc.
Time, seconds	4	61	6	5	34
Generator, kw.	725	655	60	...	...
Motor, hp.	950	850	75	...	...

Running in 140th Stand (Time: 60 Seconds)

Operation—	Hoisting (empty)	Stabbing and makeup	Pickup to free slips	Lowering pipe, etc.
Time	11	14	3	32
Generator, kw.	375	50	700	...
Motor, hp.	480	60	900	...

Draw-Works Drive and Operation

Draw works should be driven by a 350-volt, 1,000-r.p.m. motor of at least 400-600 hp. through a reduction gear of around 2.25 or 2.5-to-1 ratio. The exact reduction depends to a large degree upon the sprocket ratios through the draw works, but the motor should be turning its rated r.p.m. when the drilling line is being pulled at its normal high rate of travel. Since most motors of this voltage or slightly higher are built to slightly overrun this figure without harmful results, a very fast and snappy unit action is obtained.

If operations are to be conducted below 13,000 ft. with 4½-in. drill pipe, two draw-works motors should be installed. These twinned motors should drive through a double-reduction gear, and should be each of at least 300 to 400-volt rating. In case of failure of one unit the remaining motor will provide sufficient power to come out of the hole at very slow speed.

A policy of having motors of sufficient horsepower to absorb high-current loads must be followed to make operations certain of success, and although it is possible to overload a large electric motor to several times its rating, the additional cost per horsepower is so small that it is best to provide at least 600 hp. for 4½-in. drill-pipe loads to 13,000 ft. and 800 total electrical horsepower for equivalent pipe loads below that depth.

Conventional steam engines of 12 by 12 in. and 14 by 14-in. size develop from 1,400 to 2,000 hp. at stalling torque with 400 lb. per sq. in. steam pressure. Because of this high rating some confusion results from the ability of a much smaller rated electric motor to do equivalent hoisting work. As stated before, given sufficient generative power, the torque obtained is limited only by the ability of the armature circuit to stand heating, and since the interval of high torque is relatively small, the motor does not have time to overheat.

Assume, for purposes of illustration, that the cycle time of withdrawing one stand from off bottom at 13,000 ft. is 110 seconds. Of this total time only about 65 seconds would be hoisting time and the lightly loaded motor has sufficient time to cool off during the remaining 45 seconds.

The long strings of drill pipe are hard to start moving, because their tremendous inertia and friction must be overcome; however, readings of horsepower required to pull 13,000 ft. of 4½-in. drill pipe (16.60 lb. per ft.) with a modern electric drive draw works show that with 10 lines strung only about 950 hp. is needed to start this much pipe moving and 850 hp. will handle the moving string easily.

On pulling on stuck pipe the direct-current electric motor is still very powerful and yet fully flexible. It is easy to pull any desired amount of strain and stall the motor, catch the strain on the brake, then slack off and repeat the operation indefinitely. If tremendous strains are to be taken, they may be gradually increased to the desired maximum as with steam, the strain then being maintained with the brake. There is never any need to hold high amperages on the electric motor for long periods of time, and it is easily possible to pull a 2,500-amp. torque on a 400-hp. continuous-duty motor without hurting the machine, as long as the current is not maintained too long. A torque of this type can exert upwards of 500,000 lb. upon the drilling string when used through modern draw works, and additional strain may be pulled with this rating motor.

Heavy pulls should be taken gradually, and if evenly increased, strains to the limit of the drilling line may be imposed. Since it is not possible to overload or stall the engines, large electric rigs have tremendous pulling capacity. Horsepower is the **time rate of doing work** and the increments of power are transformed into mounting strain which can exceed the breaking strength of the drilling line.

Summary

Large electric rigs must definitely be tailor made of the very best of available equipment, but they fit very well into drilling programs of certain types. There is no question of the many unique advantages of electric power in the drilling of deep, remote wildcats, and it is hoped that the oil industry will become increasingly cognizant of this economic oversight.

An investment of $250,000 or thereabouts is without question a large sum, but such steady savings in operations costs are possible on the deep penetrations of today that the $50,000 difference between the price of electrical and steam equipment can be readily overcome.

The future of electric drilling depends upon the manufacturers' ability to prove the economy and flexibility of electric power, and to do this they must develop technical personnel that is familiar with actual drilling procedure. Development of such personnel will take time but only by such a procedure will the oil industry capitalize on those flexible designs that are directly related to future economical operation.

A great deal of the progress of the design of both mechanical and electrical rigs has been due to the active work of D. M. MacCargar, formerly with the Allis Chalmers Co. and now an independent consulting engineer of Houston, Tex. Much of both the history and electrical data that developed into this paper were learned either from or through association with Mr. MacCargar in constructing and operating direct-current rigs.

It was through working with J. C. Morrison, of the Douglas Aircraft Corp., formerly employed as electrical engineer for O. W. Dyer, Sr., and Jr., drilling contractors, that a good deal of the control and maintenance information was developed.

The author is deeply indebted to O. W. Dyer, Sr., and O. W. Dyer, Jr., for their interest and consideration during the time that he was in charge of their electrical-drilling operations.

Finally, the author expresses his thanks to his superiors in the Office of Petroleum Administration for War for permission to present this paper, with the understanding that the paper represents the author's personal viewpoint and experience gained prior to joining the PAW, and does not constitute an official expression of opinion of the PAW.

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TABLES SHOW PUMP CONDITION

TRUE conservation depends on getting the greatest amount of useful work out of anything, regardless of whether it is a man or machine. Keeping a machine only partly loaded, or keeping it in an operation where only part of its power capacity can be utilized is obviously wasteful and the same is true where a man's skill, ability or technical training is diverted to less important tasks which could be handled by someone else.

This is particularly serious at the present time when there is a shortage of technically trained men and those engaged in the producing end of the oil business are needed for the more important tasks. If the more routine duties can be detailed to pumpers and roustabouts, the engineer has that much additional time to spend on pressing problems requiring engineering skill and ability.

Just how much can and should be delegated depends on the intellect and ability of the operating personnel and on the ability of the engineers to explain the significance and the method of performing the necessary tests. In one instance a particularly patient and foreseeing engineer instructed the pumpers on a number of leases in the intricacies of taking manometer and gage readings on an orifice flange. He also devised a slide rule with which they could quickly compute the gas flow and taught them to use it. Instead of a junior engineer being required to do this work, it was then possible for the pumpers to make the necessary readings, adjustments and records.

What the saving can be by such practice is hard to determine. It may amount to the wages on only a trainee, junior or production engineer. On the other hand it may account for the saving of thousands of dollars as it gives the engineer time in which to investigate other problems, the solving of which may indicate important operational changes.

One company has done considerable work along these lines as far as the operation of the pumping equipment is concerned. Pumpers were taught to determine whether the unit was properly counterbalanced by listening to sounds made during the pumping cycle. While not as accurate as a dynamometer card, a manifold card or a meter chart, it is possible to keep a pumping unit reasonably well-balanced and rod failures down by this method. Probably on the average the units were as well balanced under this system as they were when the engineers tested and adjusted the units at considerable intervals. At least no units got completely out of balance.

The company also put the determination of the efficiency of the pump on the pumper by providing him with the accompanying table and pointing out its usage. Formerly, the engineers took pumping tests in which they measured accurately the pumps output and then decided whether the well should, or should not, be pulled. Or they would devote considerable time to checking pumping records to determine whether the pump was performing at, or near, its capacity. Now the pumper checks the production and the pump speed and by referring to the table can tell whether he should call the well to the superintendent's attention for consideration for pulling.

The table as shown has an abbreviated stroke range because all of the pumping units in the field were of two sizes and were operated in the range shown. Likewise the strokes per minute and the diameter of the bore of the pump do not by any means include all the sizes of pumps available but do include all those used in the field. Tables for installations in the individual fields or even for the individual lease are necessary.

Electric motors were employed for driving the pumping units and the strokes per minute with sheaves of different diameters used and the gear ratios used in the field are given. The pumper then does not have to count the strokes per minute but simply has to know the necessary data on sheave size and gear ratio. The daily production gage can then be checked against the table to see where the pump performance is satisfactory.

Incidentally the system used here indicates another one of the numerous savings through field equipment standardization. If a wide variety of pumping equipment had been installed, instruction of the pumpers would be made difficult as sheave sizes, gear ratio, engine and motor speeds would need to be considered for a large number of cases.

Instruction of pumpers, etc., in such duties and in even more technical ones, is not as difficult as it might seem as they have a good knowledge of how equipment works through their familiarity with it.

PUMP DISPLACEMENT THEORETICAL PRODUCTION IN BARRELS PER 24 HOURS BASED ON 85 PER CENT POLISHED-ROD STROKE

Stroke (in.)	Strokes (minute)	1-in.	1⅛-in.	1¼-in.	1½-in.	1¾-in.
18	18	32	41	50	72	98
	20	36	45	56	80	109
	22	39	50	61	88	120
	25	45	56	70	100	136
24	18	43	54	67	96	131
	20	48	60	74	107	146
	22	52	66	82	118	160
	25	59	75	93	134	182
26	18	46	59	72	104	142
	20	52	65	81	116	158
	22	57	72	89	128	174
	25	64	81	101	145	197
34	18	61	77	95	136	185
	20	67	83	105	152	206
	22	74	94	116	167	226
	25	84	106	132	190	257
44	18	78	99	122	176	240
	20	87	110	136	196	267
	22	96	121	150	216	293
	25	109	138	170	246	332

APPROXIMATE POLISH-ROD STROKES PER MINUTE WITH 1200 R.P.M. ELECTRIC MOTORS

Pulley size "C" section		Full load motor speed	Pumper unit			Pumper unit		
P.D. (in.)	O.D. (in.)		Box ratio	Sheave P.D.	S.P.M.	Box ratio	Sheave P.D.	S.P.M.
9.4	10 5/32	1,160	27.4-1	22	18.0	19.86-1	30½	18.0
10.6	11 11/32	1,160	27.4-1	22	20.4	19.86-1	30½	20.3
11.5	12 1/4	1,160	27.4-1	22	22.1	19.86-1	30½	22.0
13.0	13 3/4	1,160	27.4-1	22	25.0	19.86-1	30½	24.9

Sheave hubs belong to motors. Sheaves are interchangeable on all hubs.

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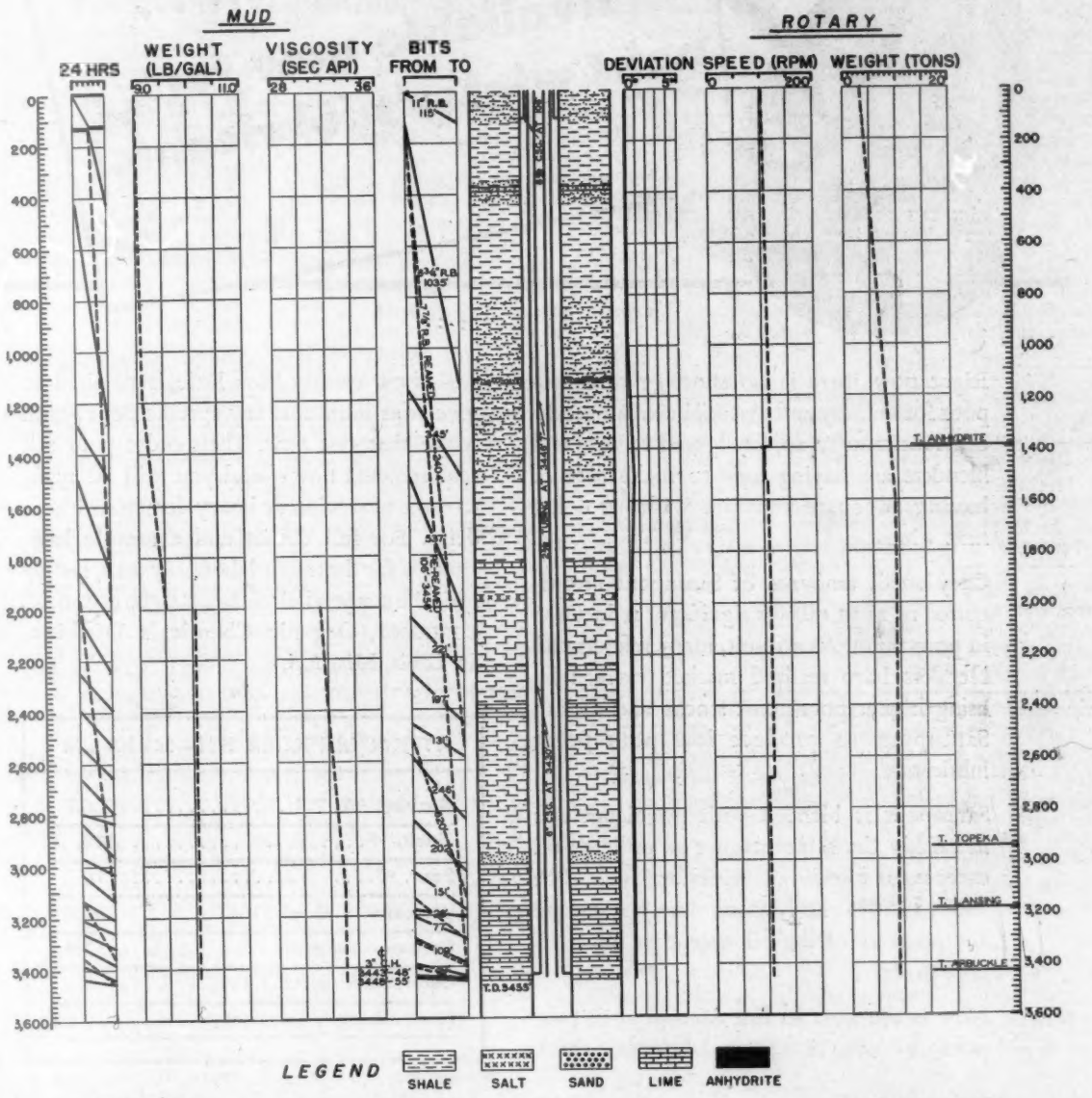
PARKER DRILLING CO.

Discovery Well, Zurich Field, Rooks County, Kansas



DRILLING DATA

Well drilled to 3,455 ft. with company-operated, slim-hole core-drilling unit as a stratigraphic test. Hole reamed to bottom and 6-in. casing run and cemented by Parker Drilling Co. with mechanical rotary rig. Cement drilled and well completed by contractor with cable tools. Time record for slim-hole unit:

Time record for slim-hole unit:	Hours
Rigging up	24
Drilling	377½
Coring (2 cores 3,443-55 ft.)	13
Run and cement surface pipe	8
W.O.C. (surface pipe)	48
Trips (10 round trips)	41½
Mixing mud and circulating	7¼
Circulating for samples	5½
Reaming	2
Shut down	25¼
Total slim-hole core unit time	528
Time for rotary rig:	
Rigging up	40½
Reaming and running 6-in. casing	99½
Tearing down	16
Total rotary rig time	156

BIT RECORD

	No. bits	Size	Type
Drilling	1	11-in.	Rock bit
Drilling	13	6¾-in.	Rock bit
Reaming	6	7⅞-in.	Rock bit
Coring	2	3-in.	Corehead

CASING RECORD

Size (in.)	Weight (lb.)	Type	Depth (ft.)	Cement (sacks)
8⅝	32	SH LW 10 thread	106	40
6	14	EW 8 R thread	3,430	150
2⅜ (tubing)			3,448	...

COMPLETION

Producing horizon—Arbuckle lime
Producing depth—3,430-55 ft.
Method of completion—Cable tools
Completion time (rigging up, bailing, drilling, cement, testing, running tubing)—132 hours
Initial potential—3,000 bbl. per day*
Water—None
*Maximum allowed by drawdown method in accordance with Kansas production rules.

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Color, NPA (85 and 15)	6.+
Neutralization number	0.02

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A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

SUBSURFACE WELL PRESSURES

ANY pressure taken in a well at some point below the surface may be spoken of as a subsurface pressure or a depth pressure.

Bottom-hole pressure, although sometimes misused, should refer to the pressure at or near the bottom of a well, usually at the face of a producing formation.

Static bottom-hole pressure denotes the pressure existing at the face of an oil-bearing stratum in a well when the well has been closed in for a sufficient length of time that it has built up a gas- and liquid-column pressure in the hole equal to the pressure existing in the oil-bearing stratum. The term refers to pressure existing after equilibrium conditions are established following production.

Shut-in bottom-hole pressure may sometimes be used as synonymous with static bottom-hole pressure, but it seems more logical to let it have a broader meaning and represent a pressure taken at the bottom of the well when the well is not producing, regardless of whether the pressure conditions have reached equilibrium. As an example, suppose that a well was produced for a period of time and then shut in. After several hours, a pressure was taken at the bottom of the well. Then after several more hours another pressure reading was taken at the bottom of the well and found to be higher than the first reading. Then, several hours later, a third reading was taken, yielding the same results as the second reading. All three of the pressures may be considered as shut-in bottom-hole pressures since the well was shut in when each reading was taken. The fact that the second reading was higher than the first indicates that the fluid pressure in the well had not become static but was still increasing at the time of the first reading. In a sense, the formation was still producing oil when the first reading was taken, not to the surface but into the well bore. The fact that the third pressure reading agrees with the second reading shows that equilibrium conditions existed in the well at the time of the second reading. So, only the last two readings may be logically called static bottom-hole pressures.

The term **reservoir pressure** refers to the pressure existing in a porous reservoir when under equilibrium shut-in conditions. Thus, the reservoir pressure is equal to the static bottom-hole pressure of a well bottomed in the given reservoir. If the reservoir is of sufficient vertical thickness that the head of fluid from the top of the sand to the bottom of the hole is enough to make a read able pressure difference, pressure readings are often corrected to some common datum such as the top of the sand or some chosen subsea elevation.

Flowing bottom-hole pressure is a term used to designate the pressure existing at or near the bottom of a well when the well is flowing at a given rate. It will be lower than the static bottom-hole pressure for the same well since a pressure loss occurs due to the flow of oil into the hole.

The term **producing bottom-hole pressure** is a convenient term to use. It may be synonymous with flowing bottom-hole pressure when dealing with a flowing well but applies equally as well to the pressure existing at the bottom of a well being pumped or produced by any other means of artificial lift.

In general, reservoir pressures may be considered to be the result of, or influenced by, one or more of the following geologic phenomena: (1) The hydraulic pressure exerted by ground water from a point of outcrop to the point of oil accumulation. (2) The natural generation of oil and gas from organic matter. (3) Weight of the overburden. (4) Secondary cementation or deposition in rock pores.

In general, the reservoir pressure that can be expected increases proportionately with depth. This general rule is based on the assumption that the oil-producing formation outcrops at some point remote from the oil pool and will accumulate a head of ground water equal to the difference in elevation of the outcrop and the oil reservoir. This is illustrated by the sketch of Fig. 1. In many fields the approximate reservoir pressure may be predicted in advance by multiplying the depth in feet below the water table by the factor 0.465. There are, however, many exceptions to this rule.

Example

Problem: Referring to Fig. 1, a well is to be drilled at point A. It is expected that the producing sand shown will be encountered at a depth of 4,000 ft. The surface elevation at A is 1,050 ft. above sea level, the surface elevation of the outcrop of the producing sand at B is 1,575 ft. above sea level.

Estimate the reservoir pressure that one would expect in the sand at C.

Solution: At point C, the sand is encountered at 4,000 — 1,050, or 2,950 ft. below sea level. So the point C is (2,950 + 1,575) or 4,525 ft. lower vertically than the outcrop at B.

Then the pressure at point C could be estimated to be about 0.465 × 4,525, or 2,104 lb. per sq. in. However, one should be careful not to place too much faith in such a prediction because of the many exceptions to the general rule and assumptions on which such as estimate is based.

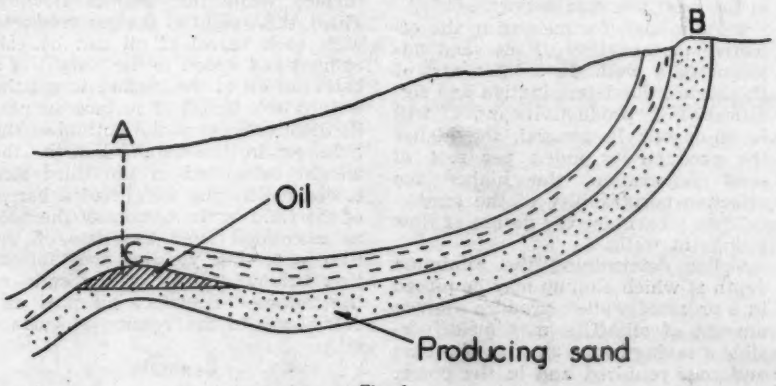

Fig. 1

Series prepared by Glenn M. Stearns, associate professor of petroleum engineering, University of Oklahoma

DEPTH PRESSURE MEASUREMENTS

DURING the past 12 or 15 years there have been developed a considerable number of practical methods of analyzing individual well conditions and field conditions by means of depth pressure determinations. The bottom-hole pressure gage, used for measuring these pressures, is now considered an indispensable item of equipment for the production engineer.

There are many applications for depth pressure measurements in both drilling and producing wells. The specific uses mentioned below are representative.

1. For the determination of the fluid content of a well, i.e., the amount of oil, water, and gas.

2. For an estimation of the time at which a well will stop flowing.

3. As a basis for the estimation of reserves in a field by measuring the pressure decline during the early life of the field and projecting it into the future.

4. As a means of determining the productivity of a well without actually producing it to capacity.

5. As a corrective factor in a proration formula to insure that each operator more nearly secures his equitable share of the oil from a pool. In this application periodic measurements of static bottom-hole pressure are made in various parts of a field. If, for any reason, the allowable assigned to a well or lease is too large, as compared to surrounding wells or leases, the static bottom-hole pressure of the overproduced well or lease will be lower than that of the surrounding wells or leases and will show up in the next pressure survey.

6. As a basis for measuring the effective permeability of the sand adjacent to a well. In a later part of this series, the determination and significance of "productivity index" will be discussed. In general, the higher the productivity index per foot of sand penetration, the higher the effective permeability of the sand.

7. As a basis for the design of flow strings in wells.

8. For determining the minimum depth at which a pump may be placed in a prorated well to produce a given amount of oil. This may make possible a saving in the amount of tubing and rods required and in the power costs for operating the well.

9. As an indication of the condition of the drilling fluid in a rotary well. Particularly, the degree of gas-cutting and differential settling of solids in a mud column in a well may be investigated by using a pressure gage to obtain a pressure gradient. This measurement may be made in connection with a formation test.

10. As a means of determining the effectiveness of a formation test.

11. For determining the location, movement, and extent of a gas cap in a reservoir.

12. As an indication of some of the geologic structural features of an oil reservoir.

13. As a basis for estimating the shrinkage of oil due to release of gas from solution when the pressure is reduced from that of the reservoir to atmospheric pressure. This method is not as accurate as a laboratory method that is more commonly employed, but it should be sufficiently accurate for certain uses when laboratory data are not available. The method can be applied only to fields in which all of the gas produced with the oil is in solution at the bottom of the hole.

This last method consists of the following steps: First, determine the density of the solution of oil and gas near the bottom of the well, below the point at which the gas comes out of solution. This may be done by measuring the pressure at two levels, say for example 200 ft. apart, in the well and using these readings in calculating the density of the fluid between the two points. Second, the gravity and quantity of gas produced per barrel of oil and the density of the surface oil is measured at the surface while the well is flowing. Third, the weight of the gas produced with each barrel of oil can be calculated and added to the weight of a barrel of oil at the surface to get the weight of a barrel of surface oil plus its dissolved gas at the bottom of the hole or in the sand. Fourth, the weight calculated in the third step is divided by the weight of a barrel of the fluid at the bottom of the hole as calculated from the data of the first step, thus yielding the "formation volume factor" or the ratio of the volume of surface oil plus dissolved gas to the volume of surface oil.

Example

Problem: A test was made to determine the "formation volume factor" at a well and the following data were taken:

Static pressures taken before flowing the well:	
Pressure at 3,555 ft., lb. per sq. in...	1,074
Pressure at 3,755 ft. (bottom of hole), lb. per sq. in.	1,145
Data taken from flow test:	
Volume of stock-tank oil produced on 1-hour flow test, bbl.	150
Volume of gas produced on 1-hour flow test, cu. ft. (measured at 14.7 lb. per sq. in. and 60° F.)	220,000
Specific gravity of gas	0.785
A.P.I. gravity of stock-tank oil, deg.	38.5

Calculate the formation volume factor.

Solution: The pressure exerted by 200 ft. of water is 0.433 × 200, or 86.6 lb. per sq. in.*

From this test the pressure exerted by 200 ft. of fluid at the bottom of the well is 1,145 — 1,074, or 71 lb. per sq. in.

Then, the specific gravity of the bottom-hole fluid is 71/86.6, or 0.82.

The weight of a 42-gal. barrel of water is 42 × 8.33, or 350 lb.†

Then, the density of the bottom-hole fluid is 350 × 0.82 or 287 lb. per bbl.

The specific gravity of the surface oil may be calculated as follows:

$$\text{Sp. gr.} = \frac{141.5}{131.5 + 38.5} = 0.833$$

Then the density of the surface oil is 0.833 × 350, or 291.5 lb. per bbl.

The density of air at 14.7 lb. per sq. in. and 60° F. is equal to 28.8/379, or 0.076 lb. per cu. ft.‡

Then, the density of the gas produced on this test is 0.076 × 0.785, or 0.0596 lb. per cu. ft.

So the weight of gas produced with each barrel of oil is equal to

$$\frac{220{,}000}{150} \times 0.0596 = 87.4 \text{ lb.}$$

Then, the total weight of a barrel of surface oil plus its dissolved gas at the bottom of the well is, 291.5 + 87.4, or 378.9 lb.

So, the formation volume factor is 378.9/287, or 1.32, meaning that the oil and its dissolved gas underground occupied a volume 32 per cent greater than that of the same oil after releasing its gas.

*See Installment 2 of this series.
†See Installment 1 of this series.
‡See Installment 57.

Series prepared by Glenn M. Stearns, associate professor of petroleum engineering, University of Oklahoma

Natural Gas

West Panhandle Output Set At 630,716,000 Cu. Ft.

Daily production of 630,716,000 cu. ft. of gas daily during May was authorized last week by the Railroad Commission in the West Panhandle field. The commission found that the demand for sour gas is relatively constant and is responsive generally to economic conditions rather than seasonal influences and that abrupt changes in the allowable production disrupt and hamper the operations of processors and purchasers of sour gas.

The commission pointed out, however, that producing capacity in the sour-gas area in the West Panhandle field is greatly in excess of reasonable demand and that it was necessary to restrict output to reasonable market demand to prevent cognizable drainage from the reservoir.

Interstate Natural Gas Co. Told to Cut Rates $1,100,345

WASHINGTON, D. C.—The Federal Power Commission May 3 directed the Interstate Natural Gas Co., Inc., which has principal offices in New York and operates in Louisiana and Mississippi, to file on or before May 15, 1943, new rate schedules which will reflect, on the basis of 1941 sales, a reduction of $1,100,345 in rates for natural gas transported and sold under federal regulation to Mississippi River Fuel Corp., Southern Natural Gas Co., United Gas Pipe Line Co. and distribution companies in Mississippi and Louisiana. The reduction, which is to become effective as to all bills rendered on and after May 15, was ordered to be distributed as follows:

Mississippi River Fuel, $301,329; Southern Natural, $146,803; United Gas (for the account of Memphis Natural Gas Co.), $148,188; distribution companies in Mississippi and Louisiana outside of New Orleans, $8,762; and United Gas for New Orleans area, $495,263.

According to the commission's staff, the half-million dollar reduction to United Gas for the New Orleans area, if passed on by United, will result in a city gate rate for natural gas at New Orleans which will be among the lowest in the country.

In a concurrent order, the FPC directed the Mississippi River Fuel Co., an affiliate of Interstate with principal offices in New York, to show cause on or before June 1 why it should not file with the commission new schedules of rates and charges for gas sold for resale for domestic, commercial, industrial, or other use, in which shall be reflected reductions, on an annual basis, equivalent to the $301,329 reduction received by it as a result of Opinion 91 and the order announced May 3. A similar show-cause order was directed at Mississippi River Fuel with respect to the $422,626 reduction received by Mississippi for natural gas purchased from United as a result of reductions in United's rates in the aggregate amount of $2,195,287 pursuant to the commission's Opinion 90 and order of April 16.

Distributing Firm Sold

ASHLAND, Ky.—A report received here from Frankfort says that the sale of the Prestonsburg Natural Gas Co. to the city of Prestonsburg for $50,000 has been approved by the state Public Service Commission.

The company buys its gas from the Kentucky & West Virginia Gas Corp. and operates a distribution system for some 600 consumers in Prestonsburg. Both the company and the city asked approval of the sale.

Prestonsburg is the county seat of Floyd County.

Long Lake, Cayuga Firms Told to Conserve Gas

AUSTIN, Tex.—Operators in the Long Lake and Cayuga fields, Anderson County, Texas, this week considered the warning from the Railroad Commission that the fields will be ordered shut down unless a satisfactory conservation plan is worked out among the producers.

The commission's warning set May 15 as the deadline for completion of the conservation plan, if a shutdown order is to be averted. A representative of the Petroleum Administration for War advised the commission April 14, at a hearing in Austin, that 6 billion cubic feet of gas annually are being wasted in the two fields.

"It is to be hoped," declared Beauford Jester, chairman of the Railroad Commission, "that all affected parties can agree on an order that will solve the problem which in turn would relieve the commission of the unpleasant task of writing an order that perchance would visit hardships."

Natural Gasoline

L.P.G. Administration Is Transferred to PAW

WASHINGTON, D. C.—Administration of liquefied petroleum gas regulations last week were transferred from the Plumbing and Heating Division of the War Production Board to the Natural Gas and Natural Gasoline Division of the Petroleum Administration for War.

Personnel of the WPB section, headed by Paul E. Thompson, was transferred to PAW without change. Details of the transfer were arranged by Donald M. Nelson, chairman of WPB, and Ralph K. Davies, deputy petroleum administrator.

The Liquefied Petroleum Gas Section continues the functions for which it was previously responsible in WPB, chiefly the administration of Limitation Order L-86, regulating the installation of equipment consuming liquefied petroleum gas.

Honolulu's Buena Vista Plant Damaged by Explosion

Honolulu Oil Corp.'s No. 2 absorption plant, in the Buena Vista hills section, Midway-Sunset field, Kern County, California, was damaged last week when a pressure tank exploded. One of the several units in the plant was damaged and the company will need a new tower.

Wet gas normally going to Honolulu's facilities was diverted to a nearby plant of Standard Oil Co. of California. Honolulu had some of the units back in operation the following day but complete repairs will delay normal operation for another several weeks. The trouble resulted from mechanical failure.

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REFINING

Largest Butadiene Plant to Start Operations in July

PORT ARTHUR, Tex. — America's No. 1 rubber plant, that of the Neches Butane Products Co. at Port Neches, will turn out its first rubber in July and will be in full production by August or September.

Those facts became known in connection with the recent visit to the plant by William M. Jeffers, rubber director, and his official inspection party, on a tour of major rubber centers.

Moreover, it was learned that rubber produced from the Port Neches plant will cost less than natural rubber produced anywhere on the globe.

Square-shouldered, blunt-speaking Bill Jeffers was escorted through the big butane plant and allied units by Herbert Henderson of Pittsburgh, Pa., vice president of the Gulf Oil Corp. and chairman of the board of the Neches Butane concern; and Carl Reed of New York, president of the Lummus Co., which holds the general construction contract.

Mr. Jeffers seemed especially impressed by the new and highly efficient welding process in use in the construction of the rubber-making facilities.

Mr. Jeffers was met at Lake Charles, La., by representatives of the Texas Co. and the Gulf Oil Corp. and brought directly through Orange to Port Neches. There the party, joined by executives of the rubber and construction concerns, had lunch at the Neches Butane Products Co. cafeteria. The party was joined by Ed Heyden, general superintendent of construction for the Lummus organization; Homer Arbuckle, secretary-treasurer of the Neches Butane company; W. H. Hoffman, president of the butane concern; Vic Hanson, Lummus superintendent at Port Neches; and C. A. Barrere, Lummus Co. project engineer.

The plant was designed throughout by a technical committee of six, one from each of the five participating oil companies and another from Lummus.

The companies, who pooled resources of men and material to organize the Neches Butane Products Co., are the Gulf, Texas, Atlantic Refining Co., Pure Oil Co. and Magnolia Petroleum Co.

The welding system which drew such cordial praise from Mr. Jeffers was designed and built by Lummus and has been an important factor in expediting construction. All the services of the oil company technicians were contributed free to the Government as a further phase of the oil industry's participation in the victory effort.

Feed stock for the butane plant will be supplied by the participating oil refineries, each of which will send its product to the butane plant by pipe line.

One circumstance which seemed to please Mr. Jeffers, probably more than anything else, was the fact that the raw materials from which butadiene is made are a byproduct of the five refineries which shortly will be turning out 100-octane aviation gasoline.

In addition to those mentioned, others who met Mr. Jeffers at Port Neches included Arthur Kelly, general manager of the chemical division of the Goodrich Co.; Dr. Waldo L. Semon, research director for Goodrich; Ray V. Johnson, general manager of the Winston Bros. Construction Co., Goodrich contractor; Arthur E. Prack of Prack & Prack, architects and engineers; J. B. Fritchman, personnel manager for Goodrich; du Bois Eastman, chairman of Neches Butane technical committee; C. A. Porter and M. J. Fowle, members of the technical committee; H. P. Moran, supervising engineer for the Defense Plant Corp., and Carl Maxwell, general superintendent of Babcock & Wilcox Co., which supervises operation of the "vessel" fabricating plant.

Accompanying Mr. Jeffers were Col. Bradley Dewey, deputy rubber director; Morehead Patterson and John Wilson, members of his staff; Dr. E. R. Gilliland, technical assistant, and Frank R. Creedon, assistant deputy director in charge of plant construction.

Thirty Alkylation Units Use Sulfuric-Acid Process

NEW YORK.—The oil industry's contributions to the war effort will be of "dramatic interest" to the public when it is possible to reveal them, declared W. S. S. Rodgers, president of the Texas Co., at the annual stockholders' meeting held here April 27. The industry's production of 100-octane aviation gasoline, for example, has increased to a volume which

would have been considered impossible 2 years ago.

Mr. Rodgers announced that Texas Co. has built and is still building refinery equipment to manufacture "substantial additional quantities" of 100-octane gasoline, toluene, base stocks for butadiene for making synthetic rubber, and aviation, industrial and automotive lubricants. He said that more than 30 plants, six of them in Texas Co.'s own refineries, are either operating or under construction to use the sulfuric-acid alkylation process, "on which our entire aviation gasoline program depends." Company engineers, he said, were the first in this country to conduct extensive research and development work on this process. He added that the company has also done considerable work with catalytic-cracking processes and is building several large units of the most modern fluid-catalytic type.

Referring to the crude oil situation, he declared that higher crude prices are necessary to enable small, independent "wildcatters" to risk drilling for oil in unproven areas. He said that unless one or more major oil fields is discovered soon, it may be necessary materially to increase the number of exploratory wells or to develop entirely new techniques for discovering oil. The alternative is the importation of crude from foreign countries within a few years.

Refiners Urged to Place Valve Orders Promptly

All refiners with legitimate needs for valves, even though requirements are projected several months in advance, were warned last week that they should place their orders immediately.

The Ship Building Division of the War Production Board, effective April 26, froze the order boards of three manufacturers of steel valves for the month of May. This action, an announcement from the Petroleum Administration for War advised, is indicative of the present trend which will likely mean completely frozen schedules of all manufacturers of steel valves in the near future.

Currently, the minimum delivery time which may be expected on steel valves is 4 to 5 months; the average time 6 months; and in extreme cases, delivery time is 11 months. On the basis of an order included in the frozen May schedule, this would mean that the valves in this group would not be available until August at the earliest, with normal manufacturing procedure.

The WPB Shipbuilding Division advised PAW that there are approximately 30,000 tons of valves which will be required in 1943 for which orders have not as yet been placed. The valve industry is, even at the present time, facing a rising demand, with the expectation that the third quarter of 1943 will be the worst period—with a considerable carry-over into the fourth quarter. The situation is so tight that the manufacture of steel valves is being subcontracted to manufacturers of machine tools, the PAW announcement said.

Montana Refinery Will Resume Operations

SHELBY, Mont. — C. Leonard Smith, who operates producing properties in the Kevin-Sunburst area, has purchased the Treasure State Refining Co. plant here from Frank Walsh. It was originally built by Mr. Smith and sold to Mr. Walsh It has been shut down for lack of crude. It is resuming operations with George Ferry and O. M. Russel in charge. It is a skimming plant with 300-bbl. capacity.

Operation Started On Aviation Unit by Atlantic

PHILADELPHIA, Pa. — The nation's supply of high-octane aviation gasoline will be increased materially as the result of the successful operation of a new production unit at the Point Breeze refinery of the Atlantic Refining Co., it was announced this week by E. J. Henry, vice president and general manager of refineries of the company.

"Test operation in the new plant for the past month has been completed and has proved highly satisfactory," said Mr. Henry. "With a staff of operators trained especially for this process we are on an around-the-clock schedule."

An idea of the scale of the new operations is given by the statement that over 20,000 gal. of hydrocarbons and catalyst per minute are circulated through the system.

Because of the importance of aviation gasoline in prosecuting the war, the company began operation of the plant at the earliest possible moment using an elaborate pilot unit to avoid those operating difficulties which usually retard the efficient operation of new plants.

The operation of this new unit at Point Breeze is another step in the advance that has been made by experts of the oil industry since the beginning of the war in improving the quality and quantity of high-octane gasoline production. Measured by the power supplied to the propeller by the most modern fuels, the old 100-octane standard has been far exceeded, with the result that the bombers and fighter planes of this country and her allies are the best fueled in the world.

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WEP 24-In. Extension Is More Than Half Finished

The laying of 435 miles of line for the WEP 24-in. extension up to the beginning of this week consisting of 361 miles of 24-in. and 74 miles of 20-in., means that the work of connecting the Norris City, Ill., terminal with the East Coast is more than half completed.

Five gangs are now welding in the field on the WEP 20-in. refined products line.

Midwestern Engineering & Construction Co. has completed laying of one of the 20-in. laterals east of Phoenixville, Pa., and has moved to Oakland, Ind., for the laying of 20-in. pipe for the products line.

An article discussing movement of oil to Norris City and future schedules for moving heating oil and West Texas crude through the big-inch line appears elsewhere in this issue.

Violence Delays Line for WEP River Crossing

A gang of 200 men armed with iron rods brutally beat employes of the stringing contractor moving pipe for War Emergency Pipelines, Inc., in the Mississippi River Crossing area on April 30. Three men were taken to the hospital.

Shortly before the attack, the sheriff deprived the contractor of the use of shot guns for protection. The violence arose from a local labor-union dispute over jurisdiction.

A closed shop agreement with George C. Boltz Dredging Co. is said to have been ignored when men stopped work at the beginning and end of April. Stoppage of work at the beginning of April is reported to be responsible for a serious delay in laying of the second 24-in. river crossing. The line at that time was within 2 days of being completed when the men struck. If it had not been for the strike the line would have been completed before the day when a tug boat and four barges collided with derrick barges engaged in laying pipe. Consequently pipe was broken necessitating the laying of another line.

Damaged pipe had ⅜-in. wall thickness. This pipe is to be laid on land and the second 24-in. crossing is to be built of ½-in. wall thickness pipe. It is pointed out that the ⅜-in. thickness of the damaged line had nothing to do with the occurrence of the accident. An article on methods used for laying pipe for the WEP Mississippi River crossings will appear in an early issue.

Stanolind Loans Engineers To WEP Organization

Assisting W. G. Heltzel, vice president, Stanolind Pipe Line Co., in the construction of eastern terminal facilities of the War Emergency Pipeline, Inc., are several men loaned to the project by Stanolind.

W. S. Partner, assistant division superintendent at Scottsbluff, Neb., has joined Mr. Heltzel at the Plainfield, N. J., office of WEP to supervise construction of the distribution system. J. R. Polston has been assisting in the design of the system. Richard W. Ellison, from Stanolind's Illinois division, is office manager at Plainfield.

A. S. Muneke, draftsman, who was loaned by Stanolind to WEP last year, was transferred from Little Rock, Ark., to Cincinnati, Ohio, when the headquarters office was moved. He is located there now.

Wisconsin Again Rebuffs Gas Pipe-Line Programs

MADISON, Wis.—Introduction of natural gas into Wisconsin suffered a second rebuff in the state legislature last week when the assembly passed, 67 to 14, a bill to impose a use tax on natural gas. The measure was messaged to the senate for action.

Natural-gas distributors would be

PIPE LINE REPAIR CLAMPS
EFFICIENT—ECONOMICAL
More than 45,000 sold

Fig. 7002 Fig. 7001
MADE WITH 1 OR 2 U-BOLTS
In Stock for Immediate Shipment
BROWN & BROWN, Incorporated
LIMA, OHIO, U. S. A.

subject to a 10 per cent penalty immediately if the tax of 7 cents per 1,000 cu. ft. was not paid on its due date. Proceeds of the excise tax would go into the state general fund for distribution on a basis of 20 per cent to counties and 65 per cent to municipalities, the state retaining the balance. Municipalities would share in proportion to their consumption.

The tax would not apply to use of natural gas in public buildings or institutions maintained by the state or its political subdivisions or by federal agencies.

The legislature recently enacted a bill requiring consent of the governing bodies of municipalities before natural gas can be introduced into any city.

Barge Coordination Limits Capacity of Florida Line

Between 28,000 and 30,000 bbl. of gasoline will be flowing through the trans-Florida pipe line by June, Petroleum Administrator Ickes predicted last week.

Nearly 16,000 bbl. a day already are flowing from Carabelle, on the Gulf Coast, to Jacksonville, Fla., on the Atlantic Coast. Deliveries through the 8-in. pipe line will be stepped up as tow-and-barge facilities on both ends of the line are coordinated.

PIPE-LINE PERSONALITIES

HUGH W. LAMBERT, division superintendent of War Emergency Pipelines, Inc., has charge of the tank-car terminal as well as operation and maintenance of the northern section of the Longview, Tex.-Norris City, Ill., 24-in. crude-oil line.

After growing up at Norton and Cottonwood Falls, Kans., where he attended the common and high schools, he worked for several years as agent and telegrapher for various railroads.

In 1920 he began 5 years' employment with the Prairie Pipe Line Co., during which he was maintenance laborer, station gager, tank-farm attendant, station engineer and relay telegrapher in Mid-Continent field.

He went with the Marland Pipe Line Co. in 1925, serving in the capacity as warehouse clerk, district clerk, and assistant district foreman in the Osage County fields before going to the Panhandle field. In Borger he was the division chief clerk and district field gager until 1930.

While the Missouri-Kansas natural-gas transmission line, now Panhandle Eastern, was being built, he was material agent, line inspector and telephone-line construction superintendent, employed by Brokaw, Dixon, Garner & McKee.

When the Great Lakes Pipe Line

Co. refined-products line was under construction he was resident engineer at one of the small pump stations in Illinois. As the line was placed in operation he was transferred to Kansas City and served in the capacity of assistant to the district superintendent, and later to the general office where he was placed in charge of the investment and construction unit in the treasury department.

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(SYNTHETIC RUBBER SEAL)

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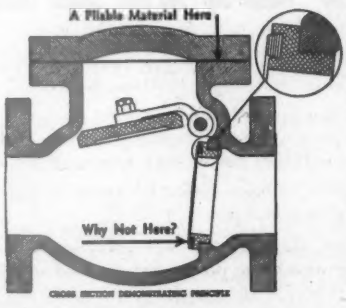

Patent Applied for

- The rubber ring conforms to all deposits and obstacles and makes it possible for this valve to seal under the worst conditions.
- Specified for gathering lines. Less pressure required for positive seal than with the metal to metal seal which depends entirely on pressure.
- The rubber ring, itself, can be replaced from our stock and no machine work is necessary for installation.
- In service two years without one complaint.
- No lapping or grinding of seats necessary.
- Absolutely silent in operation. Ideal for refineries and pumping stations where the slapping of metal check valve clappers is annoying.
- Seals regardless of viscosity. Operates equally well on kerosene or crude. Perfect for gasoline.
- Removable bronze seat ring, into which the rubber ring is inserted, can be replaced by the standard metal to metal seat, if desired.
- No additional charge for Synthetic Seal feature.

Write for Bulletin JR-343

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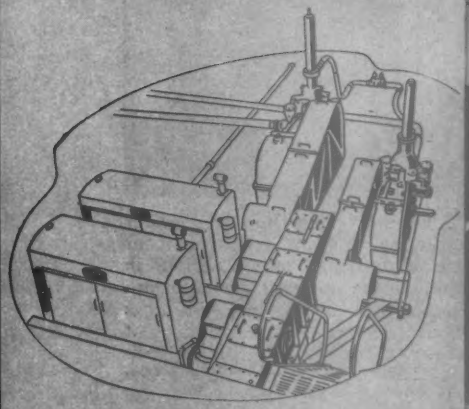

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For wildcatting or drilling in proven fields . . . for continuous operation or intermittent loading . . . Climax Blue Streak Engines "team up" with your rotary drilling rig and help you reach pay sand faster.

Engineered and equipped expressly for rotary drilling service, these engines operate successfully on any make of rig, and to any depth of hole. They give constant, high output for day-after-day drilling and for driving the slush pump . . . and possess a reserve capacity of quick-acting power for hoisting.

Here are some of the construction features that contribute to the satisfactory performance of Climax Drilling Engines:

TRIPLE FUEL EQUIPMENT . . . For operation on natural gas or butane, and gasoline in an emergency. The changeover can be made in a few minutes (different cylinder heads not required).

POWER TAKE-OFF AND SUPPORT . . . Insures rigid transmission mounting, and maintains shaft alignment.

TWIN IGNITION . . . Two spark plugs in each cylinder, and two magneto ignition systems, for maximum power output and continuity of operation.

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EFFICIENT COOLING SYSTEM . . . Cooling water enters head where heat is greatest, and insures low temperature operation. Water-cooled exhaust manifold reduces fire hazard. High-capacity radiator, fan and water circulating pump for positive circulation.

QUICK STARTING . . . Drilling engines are equipped with a small gasoline engine for prompt starting. Complete with Bendix transmission.

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General Office: DALLAS, TEXAS

Exploration and Drilling

Week's Highlights

THE magnitude of wildcatting and leasing activity in the Rocky Mountain area is gradually becoming known. This week announcement is made of a number of tests in Montana and the Dakotas. The former are designed primarily to seek stratigraphic traps, both around the Kevin-Sunburst field and in the area of possible extension of the Cut Bank field. The fact that these tests are to be drilled by a company which is a comparative newcomer to the oil industry is interesting. So also is the fact that a major company which has just entered the district has become much more active than the old established companies have been for some time (p. 157).

This follows a pattern set up in the Illinois basin where companies with headquarters in other districts entered the play and were most successful. In Kansas new companies have sprung into a leading position as oil producers. California companies have invaded the Gulf Coast and Kansas and have scored noteworthy successes. This has been reciprocated by Mid-Continent companies in California.

Nothing could more clearly emphasize the importance of collaboration than these developments. Methods which have proved successful in one area are applied in other areas by operators skilled in those methods and new production is found. Why could operators not import the methods more easily than encourage the migration of other operators who can use them?

The detailed geology around the Sweetgrass arch is quite different from that of the Sabine uplift but fundamentally the two areas offer very similar problems. Basically, Cut Bank and East Texas are very similar accumulations of oil. There is a free interchange of geological information among geologists but there is relatively little evidence that this information is applied in new areas by company geologists. This may be one reason for the success of independent operators in wildcatting. There are fewer men to "sell" on an idea in a small organization and independent operators are willing to take more chances.

The consulting geologist is also able, in many instances, to move about more freely than a company geologist and his job is solely to find oil. Company policy and the nonexploratory phases of company geological work are not his affair. He can work on successive jobs in Michigan and the Rio Grande Valley and can learn much from each area which he can apply on the next job. A company geologist opening a new district office is in very much the same position. He is not harassed by recollections of past failures in the district which would make him conservative. On the contrary, he has to make a good showing fairly quickly which makes him an optimistic liberal. This may explain the frequent successes of newcomers in old areas.

EAST TEXAS: Discovery of oil in the Travis Peak formation in Franklin County adds another Lower Cretaceous objective for drilling in the northern part of the basin. The other important pay in this series is the Paluxy (p. 152).

WEST TEXAS: Production has been found in the Holt zone east of Emma and 5 miles north of Holt production in Ector County (p. 158).

TEXAS GULF COAST: Two gas and distillate fields are opened in Matagorda County (p. 154).

LOUISIANA GULF COAST: Wilcox production has been established on the west flank of the Pine Prairie dome, Lafayette Parish (p. 154).

COMPLETIONS IN ALL FIELDS . . .

(Week Ended May 1, 1943)

	Oil	Gas	Dry	Total	Footage	Total comp. to date 1943	1942
N. Y., Pa., and W. Va.	51	18	2	71	137,223	1,020	1,202
Ohio	4	9	4	17	46,104	243	311
Indiana	2	0	2	4	7,716	80	109
Kentucky	9	1	1	11	26,227	106	78
Illinois	17	0	14	31	75,402	584	511
Michigan	2	0	10	12	37,371	140	207
Kansas	17	0	16	33	108,695	452	482
Nebraska	0	0	0	0	0	7	17
Missouri, Iowa	0	0	0	0	0	4	7
Oklahoma	13	0	15	28	110,491	367	455
Texas:							
North Central Texas	5	0	15	20	59,941	385	433
West Texas	14	0	2	16	70,057	277	617
Texas Panhandle	2	1	0	3	9,273	58	161
Eastern Texas	4	0	3	7	43,538	81	151
Texas Gulf Coast	3	0	2	5	34,571	119	286
Southwest Texas	10	0	10	20	90,263	282	478
Total Texas	38	1	32	71	307,643	1,202	2,126
North Louisiana	2	1	5	8	32,819	94	179
Louisiana Gulf Coast	0	0	3	3	19,263	102	179
Total Louisiana	2	1	8	11	52,082	196	358
Arkansas	0	0	0	0	0	71	48
Mississippi and Southeast	1	0	1	2	14,343	25	22
Montana	3	0	0	3	6,090	55	48
Wyoming	2	0	0	2	12,807	39	28
Colorado, Utah	0	0	0	0	0	5	4
New Mexico	3	1	0	4	12,516	67	79
California	24	2	10	36	137,885	374	272
Total United States	188	33	115	336	1,092,795	5,037	6,384
Total previous week	176	29	98	303			
Week ended May 2, 1942	169	38	87	294			

Devonian Production Gaining in Importance in Western Illinois Basin

SINCE the discovery of oil in the Devonian lime in the Siosi pool of southwestern Indiana in 1926, this formation has been of considerable interest to operators in the Illinois basin. Although small amounts of oil had been produced from the Devonian in Illinois, the first important production from this horizon was obtained in the Centralia field in 1940. Following the Centralia Devonian discovery, oil was discovered in the Devonian in the Salem field and the prolific production from this formation in these two pools greatly increased interest in Devonian possibilities. Since that time more than a dozen fields in the Illinois basin have been found productive in the Devonian and many important Devonian tests are under way in the basin area at the present time.

The term "Devonian" as used in Illinois is applied to a body of limestone several hundred feet thick of Devonian and Silurian age and lying immediately below the Kinderhook-New Albany black shale. In most of the Illinois basin both systems are present, but in some areas, notably in the vicinity of the Dupo and Waterloo fields, St. Clair County, and the Pittsfield-Hadley gas field of Pike County, the Devonian is absent so that the Silurian directly underlies the Kinderhook-New Albany shale. In a small part of southwestern Illinois in the vicinity of Valmeyer, both Devonian and Silurian are absent and the Kinderhook shale lies on Ordovician strata. In an area surrounding the Colmar-Plymouth field, McDonough County, the Silurian is absent and only the upper Devonian intervenes between the Mississippian and Ordovician.

Early Devonian Production

Prior to 1937, oil had been produced from the Devonian in the following areas in Illinois: Colmar-Plymouth area, Hancock and McDonough counties; Martinsville area, Clark County, and Decatur area, Macon County.

Oil shows in amounts bordering on commercial production were reported in the discovery wells in the Dix and Louden pools and several wells near Old Ripley in Bond County. The Louden pool has since been found to be commercially productive in the Devonian and commercial production from the Devonian has also been found in Bond County.

The first commercial Devonian production in Illinois was in the Colmar-Plymouth field of Hancock and McDonough counties. The discovery well of the field was drilled as a random wildcat in April 1914, and was completed at a total depth of 420 ft. for an initial production of 40 bbl. daily.

In a period of several years following the discovery, the field was expanded to cover a total of 2,450 acres by the drilling of 475 oil wells. At the end of 1942 all but 72 of these wells had been abandoned, and these were producing approximately 4 bbl. daily on the average. Total production at that time was 2,892,000 bbl., a recovery of only 1,181 bbl. per acre. Estimated ultimate recovery in the field is 1,702 bbl. per acre. This is not an attractive recovery and certainly would not be a paying proposition but for the fact that the producing sand is found at extremely shallow depths.

The Colmar-Plymouth field is located on an anticline-type structure on the extreme northwestern edge of the Illinois basin and is the most northern field found in the state to date. Production in the field is from a zone in the Devonian series known as the Hoing sand, which is found at depths ranging from 447-68 ft. and averaging 12 ft. in thickness. Tests have been drilled to the St. Peter sand within the field limits but no additional sands either above or below the Hoing have been found productive.

Other Early Devonian Pools

Other pools to produce oil from the Devonian in Illinois prior to 1937 were the Martinsville field of Clark County and the Decatur field of Macon County. Little information is available regarding these fields. The Decatur field was discovered and two wells were drilled in 1922 and 1924, but the first reported production was obtained in 1937. The total proven productive area amounted to only 10 acres and total reported production was 1,000 bbl. The Devonian in this field was found at a depth of 2,020 ft. and the thickness of the pay zone averaged 30 ft. Only two wells were drilled in the field and these were abandoned in 1939 after producing only 400 bbl. during 1938.

The Martinsville field was discovered in 1937 and production was obtained in several sands above the Devonian and in the Trenton lime below the Devonian. Since many of the wells in the field produced from more than one zone, production cannot be separated by zones and the amount of oil produced from the Devonian is indeterminable. However, 39 wells were completed in this horizon proving a total of 195 acres productive. The producing zone at Martinsville is found at a depth of 1,553 ft. and averages 30 ft. in thickness.

Oil was discovered in the Devonian in 1938 in both the Sandoval field of Marion County and the Sorento field of Bond County. Three wells were completed in the Sorento field and these had produced 4,000 bbl. of

DAILY AVERAGE PRODUCTION FOR WEEK

	May 1 crude oil	May PAW quota all oils	Apr. 24 crude oil
Arkansas	72,500	73,000	72,200
California	767,750	822,700	780,250
Colorado	6,655	7,400	6,615
Eastern fields	75,750	115,700	92,900
Illinois	225,200	250,800	222,000
Indiana	12,300	16,000	14,250
Kansas	316,250	309,700	318,800
Louisiana	346,850	359,300	346,300
North Louisiana	*88,950*	.....	*88,400*
Louisiana Gulf Coast	*257,900*	.....	*257,900*
Michigan	58,600	62,100	57,100
Mississippi	55,800	50,000	53,650
Montana	20,575	24,600	21,000
Nebraska	2,200	2,400	2,150
New Mexico	105,400	105,700	105,480
Oklahoma	342,350	379,000	341,450
Texas	1,390,150	1,562,000	1,390,150
East Texas	*319,850*	.....	*319,800*
West Texas	*214,500*	.....	*214,450*
North Central Texas	*135,000*	.....	*134,950*
East Central Texas	*99,700*	.....	*99,700*
Texas Panhandle	*91,000*	.....	*91,000*
Texas Gulf Coast	*458,000*	.....	*458,100*
Southwest Texas	*72,100*	.....	*72,150*
Wyoming	97,965	97,000	97,625
Total United States	3,896,295	4,237,400	3,921,920

Total production January 1-May 1, 1943....470,852,675 bbl.
Same period last year ..... 467,052,305 bbl.

oil to the end of 1939. None has been produced since that time. The thickness of the pay zone here, found at a depth of 1,830 ft., averaged only 5 ft. The Devonian and Sandoval proved more prolific than that at Sorento and 27 wells were completed in this formation. At the end of 1941 all but 18 of these wells had been abandoned but production from the Devonian during that year was 440,000 bbl. Cumulative production from the Devonian at Sandoval had reached 1,941,000 bbl. by the start of 1942, a recovery of 5,108 bbl. per acre. The production at Sandoval was the deepest Devonian production found to that time, top of the productive zone being encountered at an average depth of 2,924 ft. Thickness of the pay zone averaged 9 ft.

Centralia Field Development

When Devonian production was discovered at Centralia, the field was practically completely drilled up in the upper horizons. During the Devonian play, 318 producers were completed in that formation with an average initial production of 1,304 bbl. Production at Centralia was on a steady decline when the Devonian was discovered and had dropped from 200,000 bbl. a month to 150,000 bbl. during 1939. In June 1940 it reached a peak of 2,953,650 bbl. and declined to 434,930 bbl. in December, indicating the rapid decline of the Devonian production. More than half the total oil recovered at Centralia can be ascribed to the Devonian. Ultimate recovery from that formation in the field was estimated to be 12,900,000 bbl., or 3,125 bbl. per acre. This appears less than the per-acre recovery at Sandoval but it is based on the total acreage of the Central field rather than the proven acreage of Devonian production since the latter is impossible to determine because of the close and irregular spacing of wells in the field.

Development at Centralia began in the central part of the field and worked northward. The best wells in the field were almost the last drilled so that the average initials for the first 212 wells completed were around 600 bbl. In June 1940, 63 wells were completed in the northern part of the field for an average initial production of 3,369 bbl. This was the best average initial for so large a group of wells recorded in the state at that time.

Devonian at Salem

The Devonian development at Salem followed that at Centralia in some respects. The drilling up of the lower pay took longer, but covered more acreage. The picture was complicated by the fact that the upper pays were not completely drilled up when the Devonian play started. While 542 producers were brought in in the Devonian, there were 387 in the McClosky, Benoist, Aux Vases and other pays. Unlike Centralia, however, the first wells at Salem had the highest potentials and these were the highest that have ever been recorded in Illinois, some of them exceeding 10,000 bbl. daily.

Estimates of Devonian production at Salem are made difficult by the fact that many wells were perforated at the Salem and St. Louis levels and this oil is credited to the Devonian also. However, the Devonian production at Salem and Centralia caused the total daily production of the state to rise to the highest level in its history during 1940, and this level has not been attained since, even with the discovery of many additional prolific fields. Estimated ultimate recovery from the Devonian at Salem is 36,000,000 bbl. This is 6,000 bbl. per acre, the highest estimated recovery from the Devonian in any of the Illinois fields.

The Devonian pay at Salem is an extremely porous lime found at approximately 2,860 ft. The average total depth of the Devonian pay was 2,874 ft., the thickness of the producing zone averaging 14 ft.

When the Devonian discovery well at Louden drilled into the pay zone, oil was sprayed over the top of the derrick and many Illinois oil men expected another spectacular oil boom similar to the one enacted at Salem. A short time later, however, the well began making large quantities of water and interest in the Devonian at Louden subsided, many operators believing that the majority of the wells would make too much water to prove profitable. More than a year of development has proved these fears unfounded, and many wells

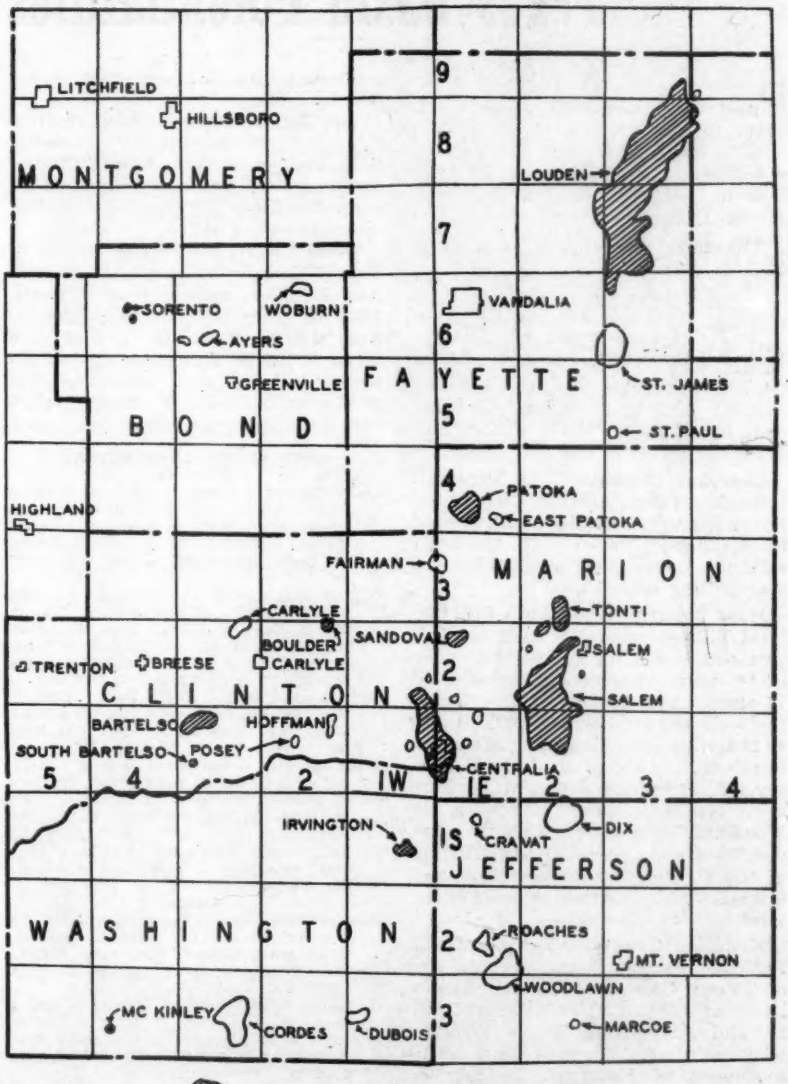

Fig. 1—Devonian pools in western part of Illinois basin

have now been completed in that formation. Unlike the development at Centralia and Salem, however, development at Louden has been slow and the wells were all completed on choke to prevent water encroachment and loss of reservoir pressure.

Ultimate recovery from the Devonian at Louden may be about equal to that from Centralia and should be less than from Salem because of the added production in that field from the Salem and St. Louis limestones. An estimate of the ultimate recovery at Louden is 4,500 bbl. per acre. Since the development at Louden has been on 20 and 40-acre spacing patterns, the recovery per well at Louden may be expected to be approximately 50 per cent greater than at Salem and approximately 125 per cent greater than at Centralia.

The Devonian pay at Louden is found at about 3,000 ft. and the thickness of the saturated zone is approximately 15 ft. Most of the wells in the field have been drilled only a foot or two into the formation in order to prevent production of excessive quantities of water. Those wells that were drilled entirely through the saturated section have mostly been plugged back leaving only the top few feet of the section open for production.

Other Pools

Devonian production has also been obtained in the Bartelso field of Clinton County, the Irvington field of Washington County and the Tonti field of Marion County. Recovery from this formation at Tonti has been more than 2,000,000 bbl. from a total of six wells. Recoveries at Irvington and Bartelso have been less than 500,000 bbl. each. A total of 25 wells was completed at Bartelso and 7 were completed at Irvington. The Devonian at Tonti was found at 3,490 ft. with a 15-ft. saturated zone. At Irvington a 5-ft. pay section was found at 3,092 ft., while the section at Bartelso was encountered at 2,429 ft. and averaged 9 ft. in thickness.

In most of the Devonian producing fields in Illinois, the pay zone has been found to be in close contact with a water table of water-drive proportions. Large bottom-hole pressures were recorded in the Devonian and large initial flows of oil were encountered, only to have the wells make large volumes of water after producing but a few days or few hours. Because of the diversified ownerships in most of the fields, there has been an unrestrained effort on the part of operators to produce their wells to the utmost. Consequently, water channeled and coned into the wells rapidly.

Recent Devonian Discoveries

Among the recent Devonian discoveries in Illinois are the Boulder pool in Clinton County, the South Bartelso pool in Clinton County, the Patoka pool in Marion County and a discovery in Christian County as yet unnamed.

The first of these discoveries was the Devonian production at Boulder. Here the Devonian lies at approximately 2,575 ft., and contains a high pressure gas zone just above the oil-saturated zone. The discovery well of the field was drilled into the Devonian where it blew off 250 bbl. of oil in a very short time and then went to gas. The well was completed as a dry gas well and shut down. It has not been produced and after it was completed no other tests were drilled to the Devonian for several months. The second Devonian well in the field

EASTERN TEXAS FIELDS

Discovery in Travis Peak Formation Adds to East Texas Basin Potentialities

DALLAS, Tex. — Tide Water Associated Oil Co. and Seaboard Oil Corp. of Delaware 1 Bacon, Maximillian Survey, flowed 209 bbl. of 47.3-gravity oil in 24 hours through 5/32-in. choke on 2-in. tubing to open a new Travis Peak pool in the East Texas district. Broken pay in the Travis Peak was encountered from 7,902-57 ft., but the well was carried to a total depth of 8,089 ft. in hard siltstone. This opens the entire north part of the East Texas basin to deeper possibilities, as it is the only well in the area producing from this horizon. Nearest production is in the Coke pool of northern Wood County, 12 miles southwest of the new strike.

Cherokee County.—L. O. McMillan 1 Southern Pine Lumber Co., Edwin Harry Survey, 10 miles southwest of Rusk, topped Pecan Gap chalk at 4,032 ft., Austin chalk at 4,850 ft., and was drilling below 5,000 ft.

Hunt County.—Stanolind Oil & Gas Co. 1 Tillson heirs, C. C. Dale Survey, swabbed 41 bbl. oil and 68 bbl. water in 14 hours after reperforating with 10 shots from 4,361-66 ft. Previously the well had swabbed 48 bbl. oil and 45 bbl. water in 15 hours through perforations at 4,318-63 ft. J. F. Morrissey 1 A. S. Rollins, James Miller Survey, reported some saturation in Woodbine sand above 2,800 ft., and operators were running casing to top of the Georgetown to perforate and test. It will be carried to the Paluxy sand.

Kaufman County. — Sun Oil Co. 1 Rutledge, Parsons Survey, reports top of Pecan Gap at 1,427 ft., Austin chalk at 1,548 ft., Woodbine at 3,307 ft., and was drilling below 3,600 ft. with no shows reported. Six miles southwest of Kaufman, Belcher & Modisette No. 1 Workman is a new wildcat location for Woodbine test, staked 660 ft. from northwest and southwest of a 67.2-acre tract in the Gillespie Survey.

Van Zandt County.—Delta Drilling Co. and C. M. Beckett 1 F. B. Smith, S. L. Flowers Survey, topped Paluxy sand at 6,464 ft., cored 6,461-66 ft. and 6,466-69 ft. with no oil showing, and was coring ahead.

Wood County.—Superior Oil Co. 1 Bennie Carlisle is a new wildcat location 4 miles southeast of Mineola, 2,525 ft. from the east and 1,900 ft. from the south line of G. Blackman Survey. Sohio Producing Co. is reported to have taken over operation of Murray Sells 1 J. C. Morgan, Harvey Hall Survey, west of Coke pool.

EAST TEXAS COMPLETIONS

Wildcats

Leon County: Albert Plummer 1 Lulu Henry, 825 ft. from N, 1,174 ft. from S, 125-ac. tract, Robert Rogers Sur., elev. 433 ft., Midway 3,735 ft., Navarro 4,703 ft., Pecan Gap 6,450 ft., dry, T.D. 6,482 ft.

Upshur County: E. Constantin, Jr. and Three C's Oil & Gas 1 J. I. Blount, 665 ft. from N, 698 ft. from W, 48-ac. tract, or 1,450 ft. from E, 3,130 ft. from S, John Trimble Sur., Woodbine 4,071 ft., dry, T.D. 4,611 ft.

Van Zandt County: Royal Pet. 1 Mrs. E. Key, Sr., 660 ft. from S and E, William Wills Sur., elev. 506 ft., dry, T.D. 7,269 ft.

Wood County: Bobby Manziel et al 1 W. J. Bailey est., 462 ft. from N, 743 ft. from E, 643 ft. from W, 40-ac. tract, or 2,172 ft. from N, 743 ft. from E, Samuel Burch Sur., elev. 464 ft., flowed 348 bbl. natural, pay 6,241-6,292 ft., Paluxy sand, P.B. to 6,347 ft. from T.D. 6,361 ft., discovery.

Fields

Kildare, Cass County: Roger Lacy 1-B John Weaver, 510 ft. from S, 660 ft. from W, 69-ac. tract, Gideon Sur., elev. 259 ft., flowed 130 bbl., perf. 6,049-56 ft., T.D. 6,070 ft.

Quitman, Wood County: Barnsdall Oil 1 Callie Kirkland, 535 ft. from N, 660 ft. from E, 40-ac. tract, W. W. Lanier Sur., flowed 117 bbl., perf. 6,252-6,311 ft., T.D. 6,365 ft.

Delta Drlg. 2 Blalock, 1,980 ft. from S, midway E and W lines tract, S. G. Purse Sur., elev. 444 ft., flowed 768 bbl., pay 6,230 ft., perf. 6,230-6,320 ft., T.D. 6,380 ft.

produced about 700 bbl. of fluid initially but nearly 50 per cent of this was water, while the third Devonian well was completed as a large gas well. The fourth well was completed as an oil well, but the gas-oil ratio was so high that the state regulatory body asked operators to plug the well in the interests of conservation of reservoir pressure, with the understanding that another test could be drilled a short distance from it.

The latest Devonian success was good for 251 bbl. initially, with an accompanying production of 378,000 cu. ft. of gas per day. From the results of these wells it has been impossible for operators to determine exactly what to expect from the Devonian at Boulder, although it is generally believed that a large reserve is present in the field. Other tests are under way at present which should help to clarify the nature of the formation.

The South Bartelso field was the first new pool in Illinois to produce entirely from the Devonian. To date only the discovery well has been completed but an offset to the well is testing the Devonian and indications are that it will make a good well. The initial production at South Bartelso was not high in the discovery well and a high production is not indicated in the offset. Nevertheless the wells have produced no water and the indicated decline of the discovery well is not as rapid as in other Devonian pools. The Devonian is encountered at approximately 2,472 ft. in this field, and the offset to the discovery found saturation continuously to a depth of 2,542 ft., although the quantity of oil in the hole did not increase after the bit had penetrated farther into the formation.

Recently, a new area in the northern part of the Illinois basin has been opened to Devonian exploration by a strike in northern Christian County, 50 miles north of the prolific Devonian area surrounding Louden and Salem. This well, the William Marlowe et al 1 Charles Ralph, S½ NE NE 27-15n-2w, drilled to 1,900 ft. and after penetrating the Devonian lime a few feet encountered a show of oil. It filled the hole and slopped over the top but did not flow, and operators predicted a production of 500 to 1,000 bbl. daily after acidization. The well, however, began making water and production dropped until it was pumping only 32 bbl. of oil every 12 hours before pumping off. At that time it was making about 4 per cent water. At present it is still producing at that rate, and operators are pumping only during the day time. The well, however, indicated the presence of a new oil field and, in view of the fact that the Devonian has proven productive to the northeast in the Decatur field and to the northwest in the Colmar-Plymouth field,

(Continued on Page 166)

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TEXAS GULF COAST

Two New Gas-Distillate Fields In Matagorda County

HOUSTON, Tex.—Two new gas and distillate pools were apparently assured this week in Matagorda County, Texas. Superior Oil Co. took an 11-hour drill-stem test at 10,594-10,717 ft. at 1 F. B. Peterson, in the Burnett & Sojourner Survey, with ¾-in. choke at the top and ⅝-in. choke at the bottom, using an 1,800-ft. water cushion. The well started flowing the water cushion in 7 minutes, then flowed 17.55 bbl. of distillate in 8 hours. Working pressure was 725 lb. The tool was pulled, and at latest report the well was drilling at 10,755 ft. in the first sidetracked hole. Gas volume was estimated at 2,830,000 cu. ft. daily. Continental Oil Co. 1 S. G. Anderson, 1½ miles southeast of Citrus Grove, flowed dry gas through a ⅞-in. choke from perforations at 3,980-90 ft., with tubing pressure of 1,660 lb. and casing pressure of 1,680 lb. Total depth was 6,555 ft., and 7-in. casing was cemented at 4,149 ft. Two-inch tubing was swung at 3,945 ft. Tests were being continued. Brewster & Bartle Drilling Co. 1 Fuller-Nelson, a wildcat test near the town of Chalmers in Matagorda County was drilling at 1,575 ft. in shale.

Liberty County.—Yegua Oil Corp. 1 J. E. Boyt, 6 miles southeast of Devers, twisted off the drill stem at 1,970 ft. and was preparing to lubricate with oil to free the fish. This well, now at 7,738 ft. in shale, topped the Discorbis at 5,260 ft., Heterostegina 5,680 ft., round Marginulina 5,580 ft. Ohio Oil Co. was at 9,080 ft. in shale and reaming hole at its 1 B. E. Quinn, 4½ miles northeast of Cleveland.

Hardin County.—H. B. Hebert and J. B. Cowden were building roads for 1. E. B. Sternenberger, a wildcat they have spotted in the H. Barber Survey, 5½ miles northeast of Kountze. Northern Ordnance, Inc., was building road and laying gas line for 1 Weiss-Hudson, in the Spencer Osborne Survey, 5 miles southeast of Balston.

Harris County.—Humble Oil & Refining Co. was at 6,960 ft. in shale and preparing to core ahead at 1 P. V. Cook, 3½ miles northeast of the Katy gas field. No shows had been reported. Ludeau Oil Co. staked location for 1 Dr. J. E. Ludeau, in the T. E. Finch Survey, 3½ miles north of Houston.

Jackson County. — Stanolind Oil & Gas Co. was coring ahead from 5,760 ft. at its 1 Four Way ranch, 3½ miles southeast of Maurbro. W. Stewart Boyle et al were at 1,810 ft. at 1. J. Wendell, M.&C. Survey.

Jasper County. — Houston Oil Co. and American Republics Corp. were clearing location for a wildcat test, 1 Castillo fee, in the S. Castillo Survey, 5 miles northwest of Buna.

Polk County. — Humble Oil & Refining Co. was at 9,936 ft. in shale at 1 J. C. Whitforth, a 10,000-ft. test in the Livingston area, and preparing to drill deeper.

TEXAS GULF COAST COMPLETIONS

Wildcats

Harris County: Cities Service 1 Mrs. Jesse A. Tucker, 3 mi. W of Ogburn field, dry at 7,562 ft.

Jefferson County: H. F. Baker 1 Louis Grossie et al, 2 mi. SE of Port Neches, dry at 8,150 ft.

Fields

Danbury, Brazoria County: Humble 1 W. A. Moller, B. S. A. Towsey Sur., A-379, 106 bbl. through ⅛-in. choke, T.P. 800 lb., C.P. 1,100 lb., gas-oil ratio 351, T.D. 6,000 ft.

Dickinson, Galveston County: Bennett Oil Co. 2 R. C. Gray, W. K. Wilson Sur., A-208, O.W.W.O., old T.D. 9,158 ft., new P.B. T.D. 8,930 ft., 8 bbl. distillate and 4,500,000 cu. ft. gas through 14/64-in. positive choke, perf. 8,922-30 ft., T.P. 1,025 lb.

Con & Gracey and W. P. Hobby, trustee, 1 L. Fedder, W. G. Banks Sur., A-36, O.W.W.O., old T.D. 8,070 ft., new P.B. T.D. 7,875 ft., 42 bbl. distillate and 2,500,000 cu. ft. gas through ¼-in. by

(Continued on Page 161)

LOUISIANA GULF COAST

Wilcox Production Reported on West Flank of Pine Prairie

NEW ORLEANS, La.—Production in the Wilcox sand is reported to have been established on the west flank of the Pine Prairie dome by Roy Lee, trustee, 1 Crowell & Spencer Lumber Co. With perforations at 10,519-39 ft. this test is reported to have flowed at the rate of 110 bbl. of 38-gravity oil daily through ⅛-in. choke with bottom-hole pressure of 3,800 lb The well was said to have entered the Sparta at 9,362 ft. and to have cored 22 ft. of that sand showing oil. Total depth is 10,605 ft.

New Wells Started.—An east offset to General Crude Oil Co. 1 C. S. Baldwin, which recently opened the new Bear field in Beauregard Parish, Louisiana, has been staked by Phillips Petroleum Co. It is 1 First National Bank of Beaumont on a 120-acre lease. Continental Oil Co. staked location for 1 Johnson-Boudreaux, in Jefferson Davis Parish, southwest of the West Mermentau field.

Acadia Parish.—Continental 1 Acadia Parish School Board, a mile north of the Richie field, at a total depth of 9,172 ft., encountered broken sand and shale showing gas. Drill pipe stuck at 9,170 ft. Pipe was cut and pulled to 3,731 ft. At latest report the crew was washing over the fish at 4,474 ft. On a 4-hour gage from perforations at 10,453-57 ft. Union Sulphur Co. 1 J. P. Gueno, Branch area wildcat, flowed at a daily rate of 64.8 bbl. of 61.4-gravity distillate, along with 40 per cent mud and wash water, through 20/64-in. choke. Tubing pressure was 1,750 lb., casing pressure 325 lb., and gas-oil ratio 67,500. Gas volume was at the rate of 4,360,000 cu. ft. daily. The well was still testing.

Terrebonne Parish.—Humble Oil & Refining Co. B-2 Continental Land & Fur Co., 12 miles southeast of Morgan City, which stood as a location for months after being staked last fall, is now drilling around 6,000 ft.

St. Landry Parish. — J. S. Abercrombie et al 1 Alexander Charles, Unit 1, 2 miles southwest of Leonville, was drilling at 8,910 ft. in sand and hard shale. No shows had been reported to this depth.

Vernon Parish.—M. S. Smith 1 Nona Mills Co., 31-3n-11w, which was temporarily abandoned last August at 360 ft. and recently resumed drilling, shut down for repairs on the rig. It topped the Cook Mountain at 1,046 ft.

LOUISIANA GULF COAST COMPLETIONS

Wildcats

Acadia Parish: Union Sulphur Co. 1 Dorris Andrus, 50-8s-2e, location abandoned.

West Baton Rouge Parish: Amerada 1 Harry B. Nelson, 97-7s-12e, dry at 10,100 ft.

Fields

Port Barre, St. Landry Parish: Texas 27 Botney Bay Lumber Co. 4-6s-5e, O.W.W.O., old P.B. T.D. 6,098 ft., cleaned, 179 bbl. through ⅛-in. choke, T.P. 960 lb., gas-oil ratio 830, perf. 5,970-84 ft.

Starks, Calcasieu Parish: W. T. Burton 10 Industrial Lumber Co., 30-9s-12w, dry at 3,623 ft.

Venice, Plaquemines Parish: Tide Water et al 1 Buras Levee Dist. 21, 27-21s-30e, dry at 5,540 ft.

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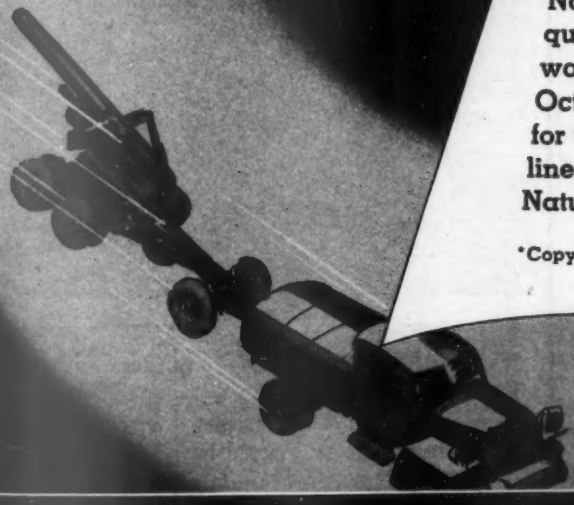

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ROCKY MOUNTAIN AREA

New Company Starts Campaign In Montana and the Dakotas

DENVER, Colo.—Extent to which new money is flowing into the Rocky Mountain area for exploration work was further indicated this week when the Carter Oil Co. announced it had sold a divided interest in several of the blocks it recently acquired in the Sweetgrass Arch area in northern Montana to Northern Ordnance, Inc., and that the latter had contracted with the Loffland Bros. Drilling Co., of Tulsa, to move five rotary rigs into the district. In addition to this operation, Northern Ordnance has acquired an interest in the Carter block in the Gage district, Musselshell County, and has made a location for its 1 Morris SW SW 15-9n-26e. The play under the farmout also extends over into North and South Dakota, with two locations announced by Northern Ordnance. These are 1 Franklin Investment, NW SW 25-133n-75w, Linton area, Emmons County, North Dakota, and 1 State, SW SW 1-17n-1e, Camp Crook area, Harding County, South Dakota.

Locations for the five tests in northern Montana have not yet been released nor, it is understood, have they been definitely decided upon except for one in the Dupuyer-Conrad district, southwest of the Cut Bank field, where the Carter block covers an area approximately 20 miles wide and 40 miles long. This is the same area in which the Texas Co. has a large block upon which a test was drilled last year. The search in this district will be for a possible shoreline extension of the Cut Bank field. Another block lies across the area to the north of the Pondera field.

In the Sweetgrass Arch the Carter interests have a belt of leases extending out for a distance of 9 miles in a circular form around the Kevin-Sunburst field, some of which was acquired when it took over the Santa Rita Oil & Gas Co. The Gage block in Musselshell County is in the district which Carter has been active for some time blocking up all the way from Devil's Basin down to the northeast corner of Yellowstone County.

The total acreage now held by Carter is not revealed, leasing having proceeded so rapidly by a large staff that other land men have been unable to keep up with them, but estimates place the figure at close to a million acres in northern Montana alone and exclusive of the immense holdings in the Dakotas and in eastern Montana. It is reported that this exploration campaign involves two especially interesting features. One is that drilling will take the place of extensive geophysical and geological work in the Sweetgrass Arch as being the more economical of the two, it being possible to test the areas to the lime at not to exceed 2,000 ft. in most instances. In eastern Montana and the Dakotas, however, extensive investigations have been made and a few tests drilled. Unconfirmed reports are to the effect that in these tests a good sand corresponding to the Wilcox was found in the Ordovician and that that horizon will be the objective.

Northern Ordnance is one of several companies which have become interested in this territory with a view to utilizing income from war contracts for investments which may build up valuable assets for post-war development. It is headed by John B. Hawley, Jr., of Minneapolis, whose Northern Pump Co. has been in the oil-equipment supply business for some time. It recently drilled one well in the Clark's Fork district in Carbon County, southern Montana, and in the Badger Basin field, northern Wyoming.

Broderick & Gordon, Denver contractors who built the Denver Ordnance and other munitions plants for the Government, also are going into oil exploration in a large way. They are at present drilling on a Stanolind block in Wallace County, Kansas, and Cheyenne County, Colorado, as well as in the Gulf Coast region. Other wells put down by this firm in this territory were in Pilot Butte, Wyoming, and Chimney Creek and the Boulder district in Colorado.

A third move in this direction took place this week when the Sharples Corp. made a location for a Tensleep test on the northwest flank of Lost Soldier, in Sweetwater County, in its 1 Good, SE NW SE 3-26n-90w. The location is not far from some wells drilled to the Sundance sand, but in an area where the Tensleep has not been drilled.

Cut Bank Study.—A decision upon the spacing program for the Cut Bank field, in which one group favors a well to the 40 and another is seeking an exception to permit a well to each 20 acres may not be made for some time. In the meantime extensive studies of the field, which is approximately 30 miles long and 3 to 5 miles wide, is being made to determine the best methods to obtain the maximum crude recovery. The Texas Co., one of the principal operators, has in progress a determination of bottom-hole pressure in various parts of the field. The Carter Oil Co., through the Santa Rita Oil & Gas Co., has plans for conducting repressuring experiments in the Lander district on the west side. There is a good sand lens about 4 miles long in that area which may be suitable for testing purposes. The biggest producer in the field was completed in this district several years ago by Santa Rita. At present the company is endeavoring to locate a compressor which will produce a pressure up to 1,000 lb. The field is quite spotted and some of the best wells are found in the thicker lenses. Whether it is possible to repressure the entire field is doubtful and any conclusions will await the outcome of the present tests and experiments. Most of the wells drilled on large blocks in the older part of the field were in the center of 40s and the operators on these blocks express the opinion that sufficient 40-acre locations remain to utilize all the manpower and equipment now available. Owners of leases on 40 and 80-acre tracts are the operators most active in seeking an exception so that a well may be drilled on each 20-acre tract. A. W. Weeks, principal petroleum analyst of PAW for District 4, who spent some time in the field investigating the facts, is now in Washington in connection with the study.

Horse Creek Development.—The General Petroleum Corp. has made a location for 32 Government SE NE NW 32-17n-68w, on the Horse Creek structure, Laramie County, Wyoming, for a deep test to the Tensleep unless production is found in the Lakota. It is ¾ mile north and ¼ mile east of No. 78-31-G, the discovery well in the Lakota, which was completed at 5,530 feet. last fall for 580 bbl. initial on the pump, but which turned to about 80 per cent water. Efforts will be made to clean out the water and restore production. The second well. 77-6-P Whitaker, ½ mile south of the discovery, which has been testing for some time, was listed as a completion this week in the Muddy sand after plugging back from 6,107 ft., finding water in the Lakota and Sundance. It proved a disappointment after having shown for a good producer on the way down. After pumping off the head, it is making 20 to 25 bbl. daily of 34-gravity clean oil. The location to the north of the discovery was made on the basis of information obtained in the drilling of the first two wells.

Edge Well at Wertz.—Sinclair-Wyoming Oil Co. 1-D Wertz (see completions) an outpost on the northwest flank of the Wertz field, appears to be close to the edge, making 73 bbl per day at 6,700 ft., from the Ten-

sleep, topped at 6,350 ft. It is ¼ mile northwest of 30 Wertz Unit, completed last fall at 6,397 ft., swabbing 775 bbl. in 24 hours.

Frannie Madison lime well.—Kirk Oil Co. 5-M Government, Frannie field, reported last week to have 2,400 ft. of oil in 20 minutes on a drill-stem test from the Madison lime, has been delayed in testing by having to recement the 7-in. It is the second well in the field in that horizon, being separated from the other by two major faults.

WYOMING COMPLETIONS

Horse Creek, Laramie County: General Petroleum Corp. 77-6-P Whitaker, SW SE NE 6-16n-68w, T.D. 6,107 ft., water in basal Sundance 6,045-71 ft., P.B. to 5,460 ft., pumped 40 bbl. initial from Muddy sand at 5,420-60 ft., now making 20 to 25 bbl. daily.

Wertz, Carbon-Sweetwater Counties: Sinclair-Wyoming Oil Co. 1-D Wertz, SE SE NW 1-26n-90w, T.D., 6,700 ft., top Tensleep 6,350 ft., 73 bbl. in 24 hours

MONTANA COMPLETIONS

Cut Bank, Glacier County: Santa Rita Oil & Gas Co. 6 Jordan, SE NE 18-32n-5w, T.D. 2,860 ft., P.B. to 2,840 ft., Cut Bank sand 1,795-2,841 ft., main pay 2,835-41 ft., swabbed 45 bbl., shot, cleaning out.

Kevin-Sunburst, Toole County: A. E. Crumley & Son 25 Fryberger, NW SE SW 24-35n-3w, T.D. 1,606 ft., P.B. to 1,635 ft. and completed in Ellis-Madison at 1,608-24 ft. for 10 bbl. oil daily after acid, 2,000 gal.

Texas Co. 1 Emmert-2, NE NW NW 15-15n-2w, T.D. 1,595 ft., in Ellis-Madison contact, acid, pumping 5 bbl. an hour.

NORTHWEST NEW MEXICO COMPLETIONS

Fulcher Basin, San Juan County: Southern Union Production Co. 1 Patented, NE 3-29n-12w, T.D. 2,035 ft., 7-in. 1,930 ft., 1,500,000 cu. ft. of gas from Picture Cliff.

PERMIAN BASIN, PANHANDLE

Production Found in Holt Zone Near Emma Pool, Andrews County

MIDLAND, Tex.—Skelly Oil Co. 1-K University, SW SW Section 28, Block 9, University Survey, 2 miles east of the Emma pool, showed 90 ft. oil on drill-stem test from 5,455-5,500 ft. to indicate production from the Holt zone of the Permian lime. A core from 5,500-10 ft., recovered 7 ft. 4 in. of which the top 3 ft. 4 in. were coarse crystalline lime with porosity, and the bottom 4 ft. were slightly stained lime with no porosity. The well is 5 miles north of nearest Holt zone production in northern Ector County.

A new deep wildcat for Andrews County is Union Oil Co. of California 1 J. D. Biles, NW NE Section 18, Block A-31, Public School Land Survey, 5 miles northwest of the Fullerton pool. Contract depth is 7,400 ft.

Howard County.—W. S. Guthrie 1 Mrs. Pauline Allen, SE SE Section 57, Block 20, Lavaca Navigation Survey, logged show of oil from 4,000-12 ft. and another from 4,038-42 ft., and is bottomed at 4,043 ft. in lime with 800 ft. of oil in hole along with 2,400 ft. of water which is believed to be coming from around the casing which is set at 3,481 ft. The well is 10 miles southwest of the Sharon Ridge pool in Scurry County, and is a like distance northwest of the Westbrook pool in Mitchell County, both of which produce from shallower pays. Should the Guthrie well produce, it will be the deepest production in the area outside of the Howard-Glasscock pool.

Gaines County. — Further development for the Russell pool, northwestern Gaines County, discovered by the Shell Oil Co., Inc., early this year, is promised by a ½-mile-south extension staked by Magnolia Petroleum Co. and Atlantic Refining Co. in the SW¼ NW¼ Section 459, Block G, C.C.S.D.&R.G.N.G. Survey. Gulf Oil Corp. 1 Kottwitz, NW NW Section 92, Block G, W.T. Ry. Survey, 8 miles northeast of Seminole pool, is fishing at 3,955 ft. No markers have been released on the well. Amerada Petroleum Corp. 6 Robertson, 8,000-ft. test on the east side of Seminole pool, has spudded and set 16-in. surface pipe at 35 ft.

Pecos County. — Bryce McCandless 1 University, Section 20, Block 26, University Survey, is drilling in granite wash at 5,430 ft. with no shows reported.

Winkler County.—Magnolia Petroleum Co. 21 State-Walton is a new location ¾ mile southeast of 20-State-Walton, which has set 4¾-in. pipe on bottom at 10,774 ft., which will be perforated opposite the pay in the Ellenburger. A. G. Carter C-2 Walton has set 7-in. casing at 9,551 ft. and cemented with 800 sacks.

Yoakum County. — Rowan Drilling Co. 1 Dixon is a wildcat location, NE NW, Section 571, Block D, J. H. Gibson Survey, 5 miles north of the Wasson pool, a 5,500-ft. test. Seaboard Oil Co. of Delaware owns most of the surrounding acreage, and it had been rumored that an 8,000-ft. test would be drilled on the block. Humble Oil & Refining Co. 1 Tannehill, Section 840, Block D, J. H. Gibson Survey, was drilling below 7,085 ft. with no change reported. Contract depth is 7,500 ft.

WEST TEXAS COMPLETIONS

Wildcats

Lubbock County: J. R. Sharp 1 R. D. Martin, NE SE Sec. 18, Blk. B-6, elev. 3,319 ft., brown lime 3,430 ft., dry, T.D. 6,061 ft.

Fields

Apco-Warner, Pecos County: Anderson-Prichard 1-B D. B. Gregg, S½ E¼ Sec. 101, Blk. 10, H.&G.N.R.R. Sur., flowed 1,949 bbl., pay 4,625 ft., line, T.D. 4,744 ft.

Clara Couch, Crockett County: Roger Harris and C. R. Inman 1 Hobbs, SW SW Sec. 5, Blk. GG, H.&G.N. Sur., pay 2,093 ft., collapsed casing and junked, T.D. 2,125 ft.

Fullerton, Andrews County: Fullerton Oil 2 McKean & Eilers, NE SW Sec. 14, Blk. A-32, Public School Lands, elev. 3,342 ft., flowed 1,611 bbl., pay 6,794-7,240 ft., acid 16,000 gal., T.D. 7,240 ft.

Keystone-Colby, Winkler County: Tide Water Associated Oil 4 C. H. Pool, SW NE Sec. 28, Blk. B-3, Public School Lands, flowed 130 bbl., pay 3,205 ft., shot 366 qt., T.D. 3,330 ft.

Lehn, Pecos County: Burk Royalty 13-C Jennie Sullivan, 330 ft. from NW, 843 ft. from NE, Sec. 72, Blk. 10, H.&G.N.R.R. Sur., elev. 2,437 ft., I.P. 120 bbl., pay 1,706 ft., P.B. to 1,727 ft. from T.D. 1,730 ft.

North Cowden, Andrews County: Atlantic Ref. and Sun Oil 2-E O. B. Holt, NW SE Sec. 8, Blk. 43-1n, T.&P.R.R. Sur., flowed 85 bbl., pay 4,554 ft., P.B. to 4,695 ft. from T.D. 4,750 ft.

Sharon Ridge, Scurry County: R. J. Byrd 3 I. B. Wade, SW SE SE Sec. 141, Blk. 97, H.&T.C.R.R. Sur., pumped 271 bbl. plus 27 per cent water, pay 2,240 ft., shot 845 qt., T.D. 2,432 ft.

Slaughter, Cochran County: Skelly Oil 1 Mallett, 440 ft. from N and W Lab. 10, Lge. 53, Scurry County School Land, flowed 246 bbl., pay 5,006 ft., acid 8,000 gal., T.D. 5,045 ft.

Superior Oil 9-C Carrie S. Dean, 1,573 ft. from S, 440 ft. from E Lge. 57, Martin County School Land, elev. 3,668 ft., flowed 595 bbl., pay 4,903 ft., acid, T.D. 4,973 ft.

Slaughter, Hockley County: J. C. Hawkins 57-A Mallett, 580 ft. from N and W Lab. 12, Lge. 47, Edwards County School Land, elev. 3,639 ft., flowed 571 bbl., pay 4,910 ft., acid 18,000 gal., P.B. to 4,975 ft. from T.D. 6,520 ft.

Wasson, Yoakum County: Honolulu Oil 14-A Ruth Bennett, 660 ft. from E, 440 ft. from S Sec. 614, Blk. D, J. H. Gibson Sur., flowed 238 bbl., pay 5,253 ft., acid 10,000 gal., T.D. 5,317 ft.

Plymouth Oil 2-C Ruth Bennett, 760 ft. from N, 560 ft. from W Sec. 630, Blk. D, J. H. Gibson Sur., elev. 3,593 ft., flowed 215 bbl., pay 5,216 ft., acid 9,000 gal., T.D. 5,290 ft.

Weiner, Winkler County: J. R. Sharp 2 S. M. Halley, 2,310 ft. from S, 990 ft. from E Sec. 7, Blk. B-11, Public School Land, elev. 2,797 ft., flowed 392 bbl., pay 3,033 ft., shot 270 qt., T.D. 3,123 ft.

West Fuhrman, Winkler County: Superior Oil 1 Lockhart & Brown, 560 ft. from S and E, Sec. 17, Blk. A-42, Public School Land, elev. 3,223 ft., flowed 357 bbl., pay 4,250 ft., T.D. 4,630 ft.

World, Crockett County: Peck & Hall 1 L. P. Powell, 1,320 ft. from S, 2,419 ft. from W, Sec. 63, Blk. NN, E.L.&R.R. Sur., elev. 3,798 ft., pumped 143 bbl., pay 2,644 ft., acid 1,000 gal., T.D. 2,649 ft.

Old Well Drilled Deeper

Mascho, Andrews County: Magnolia Pet. 1-26 University, NW NW Sec. 26, Blk. 10, University Sur., new I.P. pumped 11 bbl., shot 140 qt. 4,513-50 ft., old T.D. 4,500 ft., new T.D. 4,598 ft., P.B. to 4,595 ft.

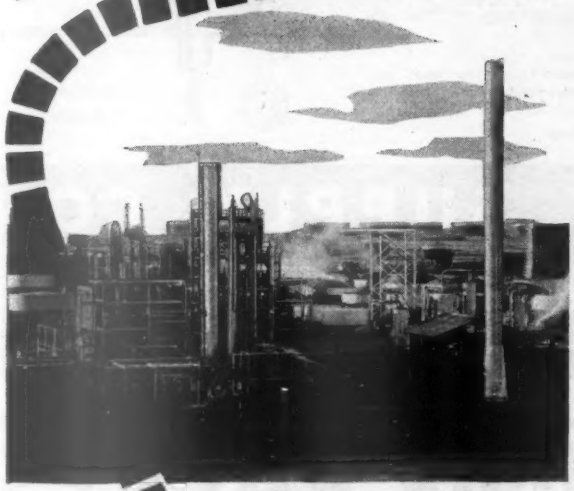
TEXAS PANHANDLE COMPLETIONS

Hutchinson County: Phillips Pet. 7 Wm.

(Continued on Page 161)

Hydrofluoric Alkylation makes important use of

Florite*



New refinery unit for Hydrofluoric Alkylation. Photograph courtesy of Continental Oil Company.

As a satisfactory desiccant and adsorbent for exacting technical processes like hydrofluoric alkylation, FLORITE is approved by leading industrial concerns. The modern plant here illustrated is typical of the extent, complexity, and very highly specialized character of installations devoted to such refining processes.

FLORITE is remarkable for its long-term effectiveness, which favors economical operation in the drying of propane, butane, air, nitrogen, carbon dioxide, refrigeration compounds, and other fluids. Write for data. Specific inquiries are welcomed by the manufacturers.

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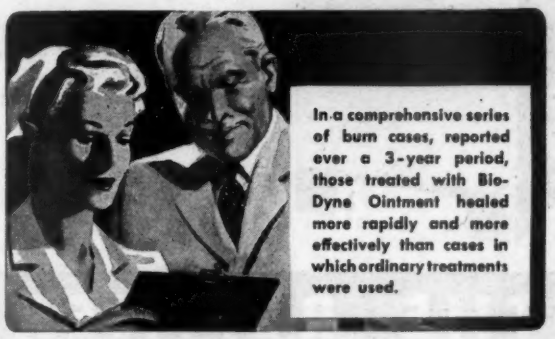
DISABILITY PERIOD SHORTENED BY NEW BIO-DYNE TREATMENT FOR BURNS


In a comprehensive series of burn cases, reported over a 3-year period, those treated with Bio-Dyne Ointment healed more rapidly and more effectively than cases in which ordinary treatments were used.

A new concept in healing . . . result of 7 years basic study in a world-famous research institute

The medical directors, as well as production executives, of many busy war plants are welcoming this new advance in burn treatment. For, with today's man-power problem, it is more important than ever to get men back on the job faster.

Bio-Dyne Ointment for burns not only results in more rapid healing and a marked shortening of the disability period, but it also achieves many other desirable results.

Exhaustive research and ever-increasing practical applications in hospitals and first aid centers show convincingly that Bio-Dyne Ointment makes application and treatment easier; results in almost immediate relief from pain; accelerates rate of healing and rate of epithelization; keeps tissues soft, minimizing scar and keloidal tissue formation.

WRITE TODAY for representative case histories from hundreds in our files. Sperti, Inc., Cincinnati, Ohio.

WHAT ARE BIODYNES? They are neither hormones nor vitamins. Biodynes are newly discovered substances given off by injured cells which regulate cellular activity. Extracted from living cells and fish livers, these natural cellular products have the power to stimulate cellular growth and respiration. And, according to famous scientists, as cellular respiration increases, healing increases.

BIO-DYNE Ointment

No other preparation for use by physicians and hospitals contains Biodynes.

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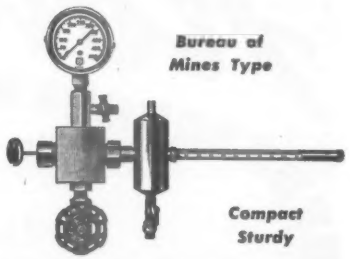

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Northwest Gustason Discovery Connects Two Oil Areas

KANSAS completions took an upturn last week when 17 oil wells and 16 dry holes were finished. The number of first reports was also holding up with 37 locations staked, two more than the previous week.

Wildcats, however, did not make such a good showing, as out of 10 tests finished, there was only 1 producer and that between two producing areas. Harry Gore 1 Kastrup, a Shell farmout in NW NW NW 15-15-20w, extended the Gustason pool approximately 1 mile west and north but was recommended as the discovery well of the Northwest Gustason pool. The well made a pumping potential of 203 bbl. of oil and 64 bbl. of water in the Lansing-Kansas City lime at 2,980-88 ft. and 3,022-27 ft., total depth. The well is also nearly equal distance from the Greenvale pool and serves as a connection between the two areas. It is about 6 miles east of the large Trapp-Sellens field.

KANSAS COMPLETIONS

Wildcats

Dickinson County: Westgate-Greenland 1-A Haines, SE SE SW 23-16-4e, dry, T.D. 2,395 ft., Mississippi lime 2,314 ft.

Ellis County: Cities Service 1 Riedel, N½ NE SW 15-13-16w, dry, T.D. 3,525 ft., Lansing 3,148 ft., conglomerate 3,437 ft., Arbuckle 3,495 ft.

Mitchell County: Northern Ordnance 1 Mary Burr, SE SW 35-8-9w, dry, T.D. 4,047 ft., Lansing 2,687 ft., Mississippi lime 3,308 ft., Hunton 3,539 ft., Viola 3,645 ft., Simpson 3,915 ft., Arbuckle 3,954 ft.

Phillips County: E. C. Harvey and Calhoun 1 M. Harvey, SE SE NE 16-5-20w, dry, T.D. 3,595 ft., Lansing 3,287 ft., Arbuckle 3,581 ft.

Reno County: Herndon Drlg. 1 Wilkey, NE NE NE 34-22-8w, dry, T.D. 4,056 ft., Lansing 3,133 ft., Mississippi lime 3,616 ft., Viola 3,915 ft., Simpson 3,936 ft., Arbuckle 4,020 ft.

Rice County: Nadel & Gussman 1 Baldwin, SE SW SW 19-18-8w, dry, T.D. 3,439 ft., Lansing 2,901 ft., Viola 3,308 ft., Simpson sand 3,358 ft., Arbuckle 3,413 ft.

Rush County: El Bar Oil 1 Schneider, SW SW SW 31-18-16w, dry, T.D. 3,950 ft., Topeka 3,170 ft., Lansing 3,481 ft., Arbuckle 3,933 ft.

Russell County: Harry Gore 1 Kastrup, NW NW NW 15-15-12w, pumped 203 bbl., Lansing 2,980-88 ft., 3,022-27 ft., T.D., extension to Kastrup pool.

Stafford County: Broderick & Gordon 1 Pierson, N½ NE SW 20-25-12w, dry, T.D. 4,230 ft., Lansing 3,622 ft., Viola 4,040 ft., Simpson shale 4,111 ft., sand 4,144 ft., show gas, Arbuckle 4,187 ft.

Plains Exploration 1 McComb, E½ NW NW 27-24-11w, dry, T.D. 3,891 ft., Lansing 3,433 ft., Misener 3,837 ft., Viola 3,847 ft.

Fields

Bemis, Ellis County: Earl Wakefield 1 Drelling, E½ NE NE 34-11-17w, pumped 137 bbl., Arbuckle 3,455-82 ft.

Bloomer, Ellsworth County: Herndon Drlg. 1 Ehley, N½ SE SE 30-17-10w, pumped 195 bbl., Arbuckle 3,243-52 ft.

Carmi, Pratt County: Shell 1 Stueder, SW NW SE 29-26-12w, flowed 255 bbl. in hr., Arbuckle 4,282-4,317 ft.

Skelly 1 Miskiman, SW NE NW 32-26-12w, flowed 217 bbl. in 3 hr., Arbuckle 4,290-4,322 ft.

Chase, Rice County: C. H. Weaver 2 Doll NW SW 20-19-9w, dry, T.D. 3,274 ft. Arbuckle 3,265 ft.

Crowther, McPherson County: Westgate-Greenland 1 Blessing, NE SE 27-17-1w, pumped 150 bbl., Mississippian chat 2,754-60 ft.

Eldorado, Butler County: Cities Service 125 Chesney, SE NE 21-25-5e, pumped 25 bbl., sand 2,190-2,206 ft., T.D. 2,215 ft.

Forest Hills, Russel County: Sunray et al 1 Kluesner, N½ NW SW 28-15-12w, pumped 453 bbl., Arbuckle 3,294-3,303 ft.

Skelly 1 Hilgenberg, N½ SW NW 20-15-12w, T.D. 3,365 ft., Arbuckle 3,348 ft

Jerry, Russell County: Stanolind 1 Dienes NE SE SE 33-14-14w, dry, T.D. 3,315 ft., Arbuckle 3,224 ft.

Karber, Barton County: Stanolind 2-B Musenberg, E½ SW SE 1-19-11w, dry T.D. 3,418 ft., Arbuckle 3,383 ft.

Kraft-Prusa, Barton County: Black-Marshall 2 Hoffman, SW SW 19-16-11w, pumped 564 bbl., Gorham 3,370-77 ft.

Black-Marshall 1-A Hitchman, NE SE SW 32-16-11w, echo potential 2,702 bbl., Arbuckle 3,323-38 ft., T.D. 5,500,000 cu. ft. gas in Lansing 3,060-64 ft.

Texas 4-B Burmeister, SE SE 2-17-11w. echo potential 2,183 bbl., Arbuckle 3,406-15 ft.

Magnolia 2 Grossardt, SW SW 9-17-11w. pumped 100 bbl. in 5 hr., Arbuckle 3,286-92 ft.

Kramer, Butler County: J. J. Lynn 2 Vandenberg, SW SW NE 34-27-6e, dry. T.D. 3,129 ft., swabbed 3 bbl. oil and 8 bbl. water.

Lindsborg, McPherson County: M & L Oil Co. 3 Gustafson, W½ SW SW 7-17-3w pumped 761 bbl., Viola 3,416-24 ft.

Auto Ordnance 1-B Bengston, W½ SW NW 30-17-3w, pumped 301 bbl., Viola 3,366-75 ft.

McLouth, Jefferson County: Apperson et al 1 Bower-McLaughlin, SE NE NE 5-10-20e, pumped 50 bbl., Mississippi lime 1,479-1,603 ft.

McLouth, Leavenworth County: Chas. Miller 1 Moses, SE SE 25-9-20e, dry, T.D. 1,492 ft.

Morel, Graham County: Continental 3 Morel, NW SE SE 15-9-21w, dry, T.D. 3,943 ft., Arbuckle 3,920 ft.

Ray, Phillips County: Cities Service 2 Griffin, SW SE NW 27-5-20w, pumped 313 bbl., Arbuckle 3,593-97 ft., 3,571-76 ft. T.D. 3,685 ft.

Virgil, Greenwood County. Aikman and Braden 2 Mannonite, SE NW 11-24-12e, pumped 15 bbl., Mississippi lime 1,747-53 ft.

FOREST CITY BASIN

ST. JOSEPH, Mo. — Apperson & Stark have completed their 1 Bower in the McLouth, Kansas pool as an oil well with a potential of 50 bbl. in 24 hours. Elevation is 1,107 ft. McLouth sand was topped at 1,430 ft.; the 6-in. casing was set at 1,479 and the hole is bottomed at 1,603 ft.

Joe Higgins and Ed Uhri 1 Redwood estate in SW SW 11-1n-14e, Richardson County, Nebraska, in the

(Continued on Page 177)

Texas Gulf Coast

(Continued from Page 154)

6-in. positive chokes, T.P. 1,500 lb., S.I. C.P. 1,500 lb.

Hitchcock, Galveston County: Stewarts 14 fee, J. Spillman Sur., A-175, 121.6 bbl. through ½-in. choke, T.P. 605 lb., gas-oil ratio 585, perf. 5,132-37 ft., T.D. 7,780 ft., P.B. 5,138 ft.

Lovell Lake, Jefferson County: Humble 33 Jefferson Land Co., B.B.B.&C.R.R. Sur., A-96, 99.45 bbl. through ½-in. choke, T.P. 2,200 lb., gas-oil ratio 4,530, T.D. 7,721 ft.

Maurbro, Jackson County: Humble 1 F. S. Robbins, O.W.W.O., old T.D. 5,216 ft., new T.D. 5,233 ft., 18.94 bbl. through ¼-in. choke, T.P. 375 lb., C.P. 600 lb., gas-oil ratio 213, perf. 5,220-24 ft.

Stowell, Jefferson County: Glenn H. McCarthy, Inc., et al 1 Maco Stewart et al, T.&N.O.R.R. Sur. 157, A-731, O.W.W.O. for dual completion, old B.B. T.D. 9,050 ft., cleaned out, perf. 8,865-70 ft. 268 bbl. through 11/64-in. positive choke, C.P. 850 lb., gas-oil ratio 644 perf. 9,002-12 ft., 793 bbl. through ¼-in. positive choke, T.P. 1,000 lb., gas-oil ratio 332.

Glenn H. McCarthy, Inc., et al 1 Stewart-Sullivan, T.&N.O.R.R. Sur. 157, A-731, O.W.W.O. for dual completion, old P.B. T.D. 9,040 ft., new P.B. T.B. 8 890 ft., perf. 8,799-8,811 ft. 262 bbl. through 13/64-in. positive choke, C.P. 1,150 lb., gas-oil ratio 1,159; perf. 8,874-86 ft. 127 bbl. in 10 hr. through 10/64-in. choke, T.P. 1,600 lb.

Permian Basin, Panhandle

(Continued from Page 158)

Yake, 9,016 ft. from N, 330 ft. from E Sec. 35, Blk. 47, H.&T.C. Sur., elev. 2,937 ft., I.P. 143 bbl., sand 2,835-60 ft., P.B. to 2,850 ft. from T.D. 2,866 ft.

Moore County: Skelly Oil 1 Mark Hight, NE NE Sec. 354, Blk. 44, elev. 3,589 ft., I.P. 41 bbl. oil plus 203 bbl. water, pay 3,356 ft., P.B. to 3,463 ft. from T.D. 3,469 ft.

Wheeler County: Smith Bros. 1 D. N. Massey, NE SW Sec. 13, Blk. 24, H.&G.N. Sur., elev. 2,626 ft., flowed 11,400,000 cu. ft. gas, pay 2,045-2,245 ft., P.B. to 2,600 ft. from T.D. 2,939 ft.

SOUTHEAST NEW MEXICO

HOBBS, N. M.—Olsen Oil Co. and Atlantic Refining Co. 1 Langlie, SE SE Section 11-25s-37e, Lea County Ellenburger test, squeezed previous perforations opposite the Simpson zone of the Ordovician and were reperforating from 8,150-70 ft.

SOUTHEAST NEW MEXICO COMPLETIONS

Fields

Grayburg-Jackson, Eddy County: Danciger O. & R. 11-B Turner, SE NE 20-17s-31e, flowed 96 bbl., pay 3,482 ft., T.D. 3,506 ft.

Maljamar, Eddy County: Emperor Oil 6-B Puckett, NE NE 25-17s-31e, flowed 75 bbl., pay 3,885 ft., T.D. 3,945 ft.

Wildcats

W. R. McKenzie 1 Yates, 540 ft. from W, 1,980 ft. from S, 18-20s-29e, dry, T.D. 1,040 ft.

CANADIAN FIELDS

Government Enters Actively Into Alberta Development

CHATHAM, Ont.—The program of the federal government in oil development and exploration for the current year was recently outlined by Hon. James A. McKinnon, minister of trade and commerce. The Alberta program calls for an outlay of $710,000, chiefly in the northern part of the province, in addition to the appropriation of $3,000,000 for the government-owned company, Wartime Oils, Ltd., to be used in assisting the drilling of marginal wells in Turner Valley.

The program includes also extensive work by geological survey parties in the central and northern parts of Alberta. In the Vermilion field of eastern Alberta, some $2,500 was spent last year in laboratory work in connection with the dehydrating of the heavy crude. Research work will be continued in this field at a cost of $25,000. In central and northern Alberta, $14,000 will be spent on geological survey parties and $20,000 for topographical work, and in aerial photography, 2,200 miles will be covered at a cost of $25,000. Seismographic work is estimated to cost $50,000 during the year, areas to be covered include the old Wainwright Buffalo Park and possibly the Sarcee Indian Reserve south of Calgary. In addition to the main $500,000 appropriation, a provision of $75,000 is made for investigation of the McMurray tar sands, independent of the Abasand operations.

Turner Valley Marginal Drilling.—Directors of Wartime Oils, Ltd., the government-sponsored enterprise which will finance the drilling of marginal wells in the Turner Valley field, is preparing to start operations. It is expected that contracts will be asked for the drilling of three or four wells simultaneously. Hon. C. D. Howe, federal minister of munitions and supply, visited Calgary last week to confer with representatives of the oil industry in regard to prospective development.

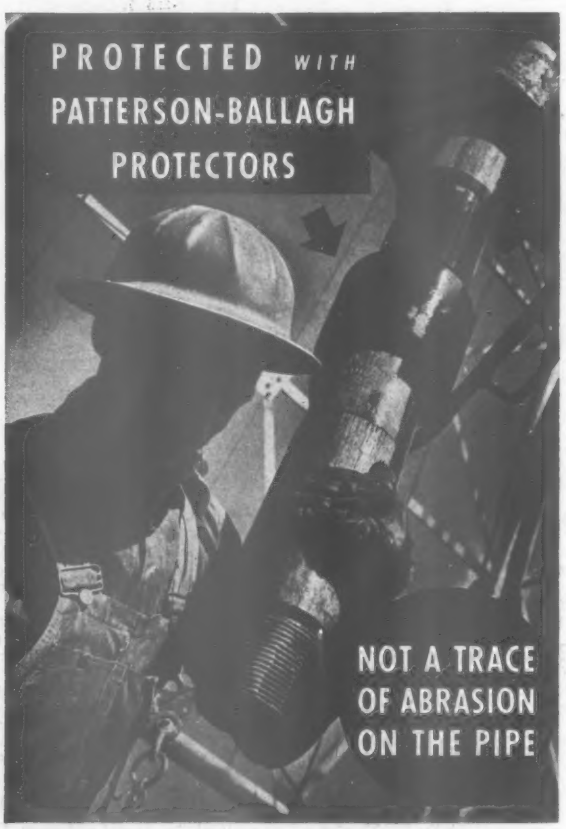
Outpost well gets lime.—In the Turner Valley north extension, Maryland Petroleums 1, LSD 8, 18-21-3w5, got the lime at 8,301 ft. and is deepening. This is the farthest north that the Madison has been proven, location being ¼ mile north and west of Atlas-British Dominion 2, the most northerly producer, where the lime was only 16 ft. higher. Casing is being cemented at 8,324 ft.

Jumping Pound.—In the Jumping Pound area, west of Calgary, Shell Exploration-Norman 1, LSD 5, 22-24-5w5, is nearing an interesting stage. The test is in the Blairmore formation below 8,292 ft. with the Madison limestone as the objective. The Jumping Pound structure is somewhat similar to Turner Valley though deeper drilling may be required to reach the limestone.

Vermilion.—R. C. Vaughan, president of the Canadian National Railways, has announced that drilling in the Vermilion field by Cannar Oils, a subsidiary of the railway, will start as soon as weather conditions permit. Drilling equipment has been moved to the field, and a cleaning plant, to process the crude for use as fuel oil in locomotives, will be erected in the drilling area. While a 50-well program was originally contemplated, the amount of money to be spent in drilling will depend on the results secured in the initial tests. These will be sufficiently extensive to determine the value of the field as an oil producer.

Independent operators through the Alberta Petroleum Association have submitted a memorial to the federal oil controller urging cooperation in providing marketing outlets for their crude production. Most of the Vermilion wells have been shut in since the closing down of the Borrodaile processing plant last November, or have been pumping their production into earthen storage in the field, and substantial quantities of heavy crude have accumulated.

(Continued on Page 191)



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SOUTHWEST TEXAS

Shallow Oil Field in Prospect Northeast of Rio Grande City

CORPUS CHRISTI, Tex. — Possibility that a new shallow oil field might be in the making turned attention last week to Baldridge & King's wildcat, 1 Mary H. Edgerton, 12 miles northeast of Rio Grande City, in Starr County. This test, drilled to 4,500 ft. and plugged back to 1,245 ft., was swabbed in and for 5 hours flowed oil and wash water, then died. Shut-in casing pressure was 350 lb. All perforations were squeezed off, and as the week closed, the crew was waiting for cement to set. The prospective pay sand in this area is the Frio of Oligocene age which is the pay horizon in the neighboring Rio Grande City field. Production is not great in that field but the shallow depth makes it attractive.

Operations at Sun Oil Co.'s northeast outpost, 1 Mrs. W. Wiechring in the Quinto Creek area of Starr County, awaited issuance of permit. Projected depth is 5,500 ft. Sun has derrick up for a west-outpost well, 1-A George H. Coates-State, in the Francisco Alvarado Survey 516, in the North Rincon field, Starr County. Lockhart & Davenport have spudded 1 First National Bank of Mission, a semiwildcat test 10 miles north of Rio Grande City and ¼ mile south of Ike Howeth 1 E. P. Caffarelli, which recently opened the new Lockhart field in Starr County.

La Salle County.—Quintana Petroleum Corp. was rigging up for a 6,000-ft. wildcat test 4 miles southwest of the Washburn field. The well is 1 F. J. Gauwemeier. Quintara had derrick up for 1-B Grausemeier, 9 miles south of Los Angeles, and it was moving in material for 2-D South Texas Syndicate, 8 miles southeast of the Washburn field. Quintana was still testing at 1-D South Texas Syndicate, 14 miles south of Fowlerton. This well, now below 7,100 ft., tested gas.

Live Oak County.—Moore Development Co. was drilling at 3,113 ft. in shale at 1-A Clara Briam, in Dennis McGowen Survey. H. Coquat Co. has spudded in 1 M. Coquat, wildcat test 2½ miles northeast of Oakville, in the J. Poitevant Survey.

McMullen County. — At total depth of 5,204 ft. Gulf Oil Corp. found the hole off vertical at 1 Two Rivers Ranch Co., 4 miles southeast of Tilden, and plugged back to 3,894 ft. to straighten. At latest report the well was drilling at 3,950 ft. in the sidetracked hole.

Zapata County. — Texas Co. was moving in for two wildcat tests. One is 1 T. Davis, in Survey 292. The other is 1 Bert Hartman, in the same survey, 5 miles west of Guerra.

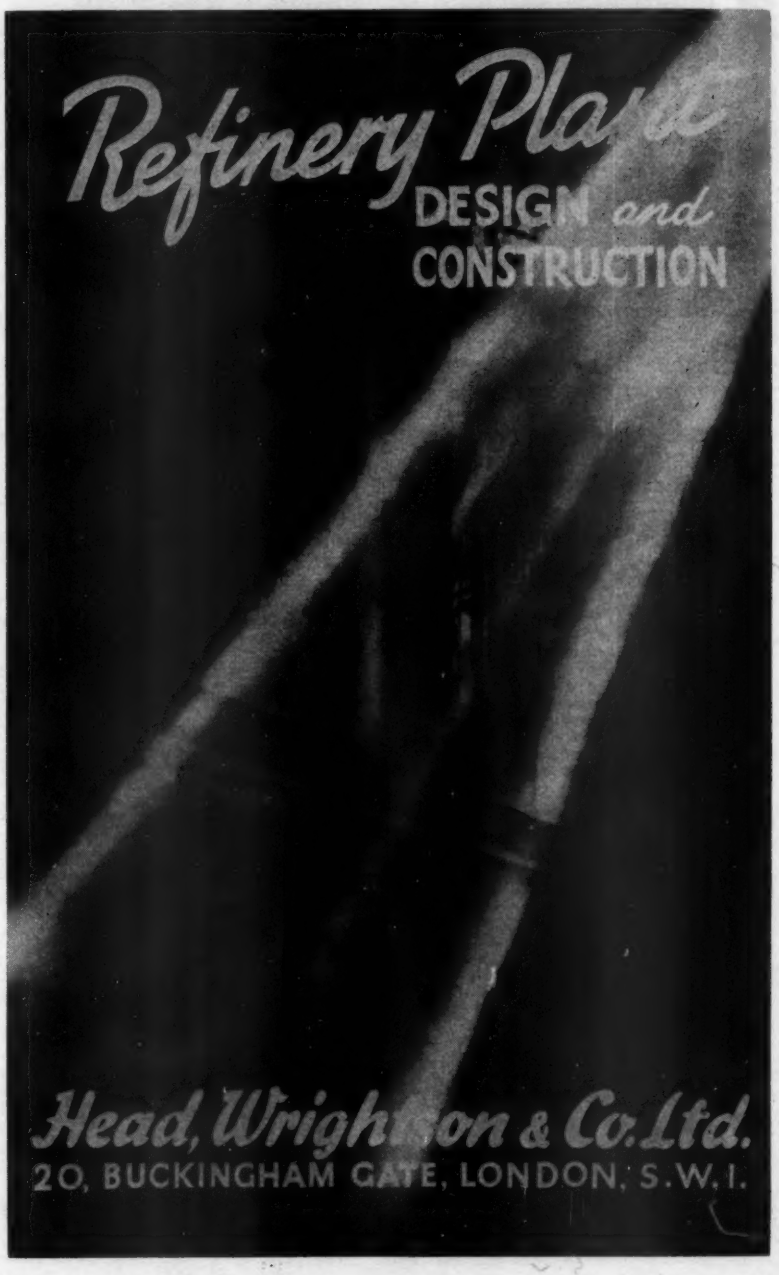
San Patricio County.—Active wildcat operations continued. Arkansas Fuel Oil Co. had derrick up for 1 E. Terrell, 4 miles southwest of the Cologne gas field. John T. O'Neil was below 7,100 ft. at 1 J. F. Welder, 3 miles southwest of the Odem field, where oil shows were encountered in a series of tests. Kilgore Developers spudded 1 Thomas Dix, 5 miles northeast of Mathis.

Karnes County.—J. W. Mayo et al staked location for 1 J. W. and F. Moczygemba, in the E. Seguin Survey, 2 miles southwest of Falls City. Luling Oil & Gas Co. has derrick up for 1 J. Q. Faith, 4 miles southeast of the new Hobson field.

SOUTH TEXAS COMPLETIONS

Wildcats

Duval County: Wynn Crosby Drilling Co.



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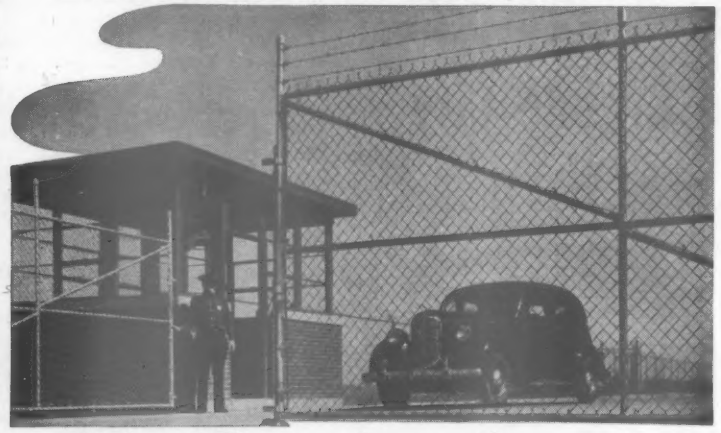

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1 M. Garcia, 7 mi. NW of San Diego, dry at 5,015 ft.

Quintana 1-B J. F. Welder heirs, 3 mi. W of Fitzsimmons field, dry at 4,903 ft.

Jim Hogg County: Locke Purnell 1 S. K. East, Sur. 619, O.W.D.D., old T.D. 3,260 ft., dry at 3,722 ft.

Republic Natural Gas Co. 1 O. M. Thompson, 3 mi. SE of Thompsonville, dry at 3,256 ft.

Starr County: Kirby Drilling Co. 1 M. Elizondo, 5 mi. SW of Robberson, dry at 6,001 ft.

Webb County: W. T. Rigney and E. E. Farrier, 12 mi. SW of Aguilares, dry at 1,107 ft.

Fields

Aviator, Webb County: Dullup Oil Co. 2 Bruni, Alberca de Arriba grant, A-1996, location abandoned.

Cadena, Duval County: Taylor Refining Co. 3 E. Cadena, C. Rios Sur., A-1026, 99 bbl. through 13/64-in. choke, T.P. 1,170 lb., C.P. 1,380 lb., gas-oil ratio 6,300, T.D. 5,443 ft., P.B. 4,621 ft.

Colorado, Jim Hogg County: Sun 18 N. S. Thaxton, 68 bbl. through $\frac{8}{64}$-in. choke, T.P. and C.P. 100 lb., gas-oil ratio 184, T.D. 3,094 ft.

Driscoll, Duval County: Continental 15-B Clara Driscoll, J. P. Nelson Sur., A-909, 120 bbl. through ¼-in. choke, gas lift, T.P. 60 lb., C.P. 450 lb., gas-oil ratio 115, perf. 2,903-10 ft., T.D. 3,795 ft., P.B. 3,240 ft. (new sand for this part of field).

Randado, Jim Hogg County: W. C. McBride, Inc., 1 C. Palacios, S. C. Hendricks Sur. 291, A-161, dry at 3,512 ft.

Sejita, Duval County: L. H. Wentz 1 C. R. Salinas, San Pedro de Charco Redondo grant, A-475, 148 bbl. through ⅛-in. choke, T.P. 820 lb., C.P. 1,440 lb., gas-oil ratio 700, perf. 5,767-72 ft., T.D. 5,796 ft.

LOWER GULF COAST COMPLETIONS

Wildcats

San Patricio County: L. Glasscock 1 G. A. Dickerman, 2¾ mi. SW of Taft, dry at 7,297 ft.

Victoria County: Rowan & Hope, 1 A. Ragsdale, 6 mi. S of Inez, dry at 4,610 ft.

Fields

Greta, Refugio County: Monday Oil Co. 8 J. F. B. Heard, J. H. Peoples Sur. 247, 81 bbl. through ⅛-in. choke, T.P. 310 lb., C.P. 650 lb., gas-oil ratio 205, perf. 4,405-13 ft., T.D. 4,459 ft.

Hobson, Karnes County: Seaboard 1 E. Plueckhahn, E. Seguin Sur., A-10, 196 bbl. through 5/32-in. choke, T.P. 475 lb., C.P. 700 lb., gas-oil ratio 150, perf. 4,032-36 ft., T.D. 4,040 ft.

Petronilla, Nueces County: Coquat, Buescher & Eaton 1-C J. R. Knight, Robert & White subd. of Schallert tract, 45.5 bbl. through 3/32-in. choke, T.P. 1,300 lb., C.P. 2,525 lb., gas-oil ratio 4,530, T.D. 6,971 ft.

Richard King, Nueces County: Southern Minerals Corp. 4-C Richard King, Agua Dulce grant, 191 bbl. through ⅛-in. choke, T.P. 925 lb., C.P. 1,075 lb., gas-oil ratio 745, perf. 5,572-77 ft., T.D. 5,580 ft.

Seeligson, Jim Wells County: Premont Development Co. 1 Eastburn, Unit 7, 186 bbl. through 7/24-in. choke, T.P. 1,175 lb., C.P. 1,200 lb., gas-oil ratio 530, perf. 6,070-80 ft., T.D. 6,120 ft.

Stratton, Kleberg County: Humble 29 King ranch-Paso Ancho, Paso Ancho de Abajo grant, 70 bbl. through ⅛-in. choke, T.P. 600 lb., gas-oil ratio 760, T.D. 6,667 ft.

SOUTH CENTRAL TEXAS COMPLETIONS

Wildcats

Atascosa County: J. A. Hardcastle Co. 1 C. C. Kingsley, Nancy McAda Sur. 1550, A-565, dry at 1,007 ft.

Travis County: Marts & Beaven, Inc., 1 Ed Pierson, Thomas Westbrook Sur., dry at 1,590 ft.

APPALACHIAN FIELDS

New Test Starting on Chestnut Ridge

PITTSBURGH, Pa. — On Chestnut Ridge, in Georges Township of Southwest Pennsylvania, Greensboro Gas Co. is clearing location and grading road to 4 Barton Heirs. The elevation is 2,451 ft. In South Union Township, the test of the Peoples Natural Gas Co. on the Walters lease was drilling at 7,855 ft. After a further topographic survey it was decided that the well had not reached the Oriskany formation but was in a continuation of the Onandaga Chert beds. Additional gas was found at 7,821-25 ft. but the test of all gas has settled to 190,000 cu. ft. New Penn Development Co., William E. Snee et al were drilling at 8,000 ft. in 2 Indian Creek Coal Co.

Westmoreland County.—On Laurel Ridge, in Ligonier Township, New Penn Development Co., William E. Snee et al were drilling in the test on the John and Eleanor Beck farm at 7,571 ft. On Chestnut Ridge, in Derry Township, Peoples Natural Gas Co. was drilling at 1,660 ft. in the test on the Camilla Giffon farm.

SOUTHWEST PENNSYLVANIA COMPLETIONS

Armstrong County, Burrell Township: J. K. Sharp, trustee, 1 T. E. Beck, 150,000 cu. ft. gas, Hundred-foot 1,330-1,470 ft., gas 1,351-56 ft., T.D. 1,543 ft.

Cowanshannock Township: T. W. Phillips Gas & Oil Co. 3 Helvetia Coal Co., 28,000 cu. ft. gas, Murraysville and Speechley, T.D. 3,484 ft.

Red Bank Township: Boyd & Shoup 1 A. H. Smith, 100,000 cu. ft. gas, Murraysville and Hundred-foot. T.D. 3,172 ft.

Fayette County, Menallen Township: J. H. Cornell 1 C. & S. Rockwell, dry, T.D. 2,466 ft.

Greene County, Jackson Township: Equitable Gas Co. 2 R. L. Hoskinson, 40,000 cu. ft. gas, Big Injun, T.D. 3,536 ft.

Equitable Gas Co. 1 A. L. Grimes, 50,000 cu. ft. gas, Thirty-foot, T.D. 3,538 ft.

Washington County, Somerset Township: Furman Nuss et al 1 John K. Science. 50,000 cu. ft. gas, Stray sand 1,730-40 ft., gas 1,734 ft., T.D. 2,970 ft.

WEST VIRGINIA

Kanawha County. — In Poca district, Glenn Dearth et al are shut down at a depth of 1,667 ft. in 1 Robert Wines. Top of Big lime was 1,586 ft. The well flowed 218 bbl. of oil in 48 hours, with gas testing 189,000 cu. ft.

In Union district, Godfrey L. Cabot, Inc., acidized 1051 John Woodrum in the Big lime formation with 1,000 gal. Sixty minutes later the well gaged 5,700,000 cu. ft. of gas and in 18 hours had a rock pressure of 685 lb.

Wood County.—In Union district, Sinclair Prairie Oil Co. is starting a test on the H. M. and Ada K. Bunting farm. It is located 2.9 miles west 81 degrees 20 minutes and 1.5 miles south 39 degrees 20 minutes; surface elevation 815.6 ft.

Wyoming County.—In Center district, Godfrey L. Cabot, Inc., completed acidizing 1077 C. C. Sharp with 1,000 gal. in the Big lime formation and increased the gas to 1,476,000 cu. ft.; rock pressure 845 lb. in 18 hours.

WEST VIRGINIA COMPLETIONS

Braxton County, Birch district: Pgh. & W. Va. Gas Co. 7941 Leta Snodgrass et al, 29,000 cu. ft. gas after shot, Big Injun, T.D. 2,241 ft.

Salt Dick district: Pgh. & W. Va. Gas Co. 7938 G. W. Fleming, 29,000 cu. ft. gas after shot. Big Injun, T.D. 2,303 ft.

Calhoun County, Washington district: Gerald Jones 1 C. M. Starcher, 771,000 cu. ft. gas, Squaw, T.D. 2,200 ft.

Clay County, Buffalo district: Pgh. & W. Va. Gas Co. 8912 Elk River C. & L. Co., dry, T.D. 2,357 ft.

Gilmer County, Troy district: A. E. Ellis 1 J. J. Flesher, 153,000 cu. ft. gas, Big Injun, T.D. 1,805 ft.

Kanawha County, Poca district: Columbian Carbon Co. 699 W. H. Milam, 5,215,000 cu. ft. gas, Big lime 1,761 ft., gas 1,861-64 ft., T.D. 1,866 ft., will acidize.

Lewis County, Freemans Creek district: Carnegie N. G. Co. 1464 C. W. Rinehart, drilled deeper from 1,529 ft., 119,000 cu. ft. gas after shot, Fifth 2,420-39 ft., gas 2,423-25 ft., T.D. 2,450 ft.

Hope Nat. Gas Co. 8634 J. W. Kemper, 182,000 cu. ft. gas, Fifth, T.D. 2,316 ft.

Lincoln County, Jefferson district: United Fuel Gas Co. 5155 Huntington Dev. Gas Co., 377,000 cu. ft. gas, Brown shale at 3,238 ft., T.D. 3,470 ft.

Monongalia County, Battelle district: O. M. Fox 1 Minnie M. and Tella Lemley.

(Continued on Page 177)

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Deep Trenton Test in Meigs County, Ohio, Is Dry

ZANESVILLE, Ohio.—The Sinclair Prairie Oil Co. plugged its deep wildcat on the Longsworth tract in Olive Township, Meigs County, at 7,466 ft., about 500 ft. in the Trenton limestone. No shows of oil or gas were found. The Trenton Gas Co. also plugged a wildcat near Oak Hill at 3,045 ft. without finding any shows in the shales or Clinton sand. The Ohio Fuel Gas Co. is drilling a well to test the Clinton sand about 1,400 ft. below the Oriskany horizon in the center of the Wheeling pool. Dave Fox is drilling a Clinton sand wildcat in Section 7, Aid Township, Laurence County.

OHIO COMPLETIONS

Ashland County, Lake Township: Hogue et al 3 A. A. Easley, Sec. 21, Clinton, 758,000 cu. ft., T.D. 2,998 ft.

Athens County, Lodi Township: H. B. Walker 1 Edna Shuler, Sec. 3, Cow Run, 265,000 cu. ft., T.D. 742 ft.

Jackson County, Madison Township: Trenton Gas Co. 1 Oak Hill Fire Brick Co., Sec. 30, Clinton, dry, T.D. 3,045 ft.

Knox County, Brown Township: Preston Oil 1 A. R. Snively, Lot 11, Clinton, 17 bbl., T.D. 2,792 ft.

W. L. Blakely 1 Mary Mix, Lot 12, Clinton, 2 bbl., T.D. 2,763 ft.

Licking County, Mary Ann Township: Preston Oil 1 Ira E. Wolfe, Sec. 8, Clinton, 15 bbl., T.D. 2,643 ft.

Lorain County, Eaton Township: Ohio Fuel 1 Depositors M. & L. Co., Lot 9, Clinton, dry, T.D. 2,693 ft.

Wellington Township: Ohio Fuel 1 George L. Hines, Lot 4, Clinton, 543,000 cu. ft., T.D. 2,485 ft.

Meigs County, Olive Township: Sinclair Prairie 1 Longsworth, Sec. 14, Trenton, dry, T.D. 7,466 ft.

Monroe County, Franklin Township: Christy et al 1 Ross Holland, Sec. 7, Salt sand, 19,882 cu. ft., T.D. 1,585 ft.

Morgan County, Marion Township: C. P. Bowman 21 W. O. Shook, Cow Run, 2 bbl., T.D. 498 ft.

York Township: Moore et al 2 Caroline Weaver, Sec. 31, Cow Run, 300,000 cu. ft., T.D. 417 ft.

Swingle et al 2 Clyde Foraker, Sec. 31, Berea, 80,000 cu. ft., T.D. 1,203 ft.

Perry County, Pleasant Township: Ohio Oil 1 David Rugg, Sec. 6, Clinton, 1,500,000 cu. ft., T.D. 3,673 ft.

Reading Township: Industrial Gas 1 Lewis Leibig, Sec. 22, Clinton, dry, T.D. 3,105 ft.

Stark County, Pike Township: Belden et al 1 Paul T. Serva, Sec. 3, Clinton, 212,000 cu. ft., T.D. 4,921 ft.

Wayne County, Clinton Township: Ohio Fuel 1 Wilson Miller, Sec. 24, Clinton, 796,000 cu. ft., T.D. 3,075 ft.

INDIANA COMPLETIONS

Gibson County: Kingwood Oil Co. 1 Witherspoon, C SW NW 19-3s-11w, dry 2,669 ft., upper Glen Dean 1,912 ft., Barlow lime 2,158-64 ft., Cypress 2,172 ft., Paint Creek lime 2,287 ft., Paint Creek sand 2,316-25 ft., Renault 2,384-95 ft., Aux Vases 2,402 ft., Ste. Genevieve 2,432 ft. McClosky 2,662 ft., St. Louis 2,665 ft.

R. D. Brown, Inc., 4 fee, NW SW NW 36-1s-10w, pumped 30 bbl. sand at 1,406-19 ft., T.D. 1,445 ft.

R. D. Brown 6 fee, NW NW NW 36-1s-10w, pumped 53 bbl. sand at 1,394-1,416 ft., shot, T.D.

Posey County: Carter Oil and Gulf Refining 1 Dixon, wildcat, SW SW NW 29-7s-12w, dry at 2,186 ft.

EASTERN KENTUCKY

ASHLAND, Ky.—One gas well was completed in the Eastern Kentucky area this week, a dry hole was reported and another well has hit sand and is ready to be drilled in according to reports received here.

Drilling activity in general showed a slight increase and four new locations were reported while three wells are nearing completion levels and a fourth is waiting for shot.

The Inland Gas Corp. completed 242 Millard Conley on Rockhouse Creek in Johnson County at 2,390 ft. in Big Six. The well has an open flow of 444,000 cu. ft. of gas.

Kentucky West Virginia Gas Co. 711 G. W. Newsom on Shelby Creek in Pike County was dry at 3,537 ft.

A report from Lee County credits May & Amyx with hitting sand at 600 ft., carrying a show of gas at 2 Rufus Jackson, Tract 3, on Duck Fork. The well probably will be drilled in during the week.

WESTERN KENTUCKY

OWENSBORO, Ky.—The Smith Mills pool in Henderson County returned good completions and another very promising well in the past week in review. The latter was Frontier Fuel Co. and Cherry & Kidd 13 Burbank which filled 800 ft. with oil from Cypress sand at 2,302-7 ft.

WESTERN KENTUCKY COMPLETIONS

Smith Mills, Henderson County: Gulf 7 Williams swabbed 500 bbl. in 24 hr. from Cypress sand at 2,293-2,315 ft., T.D.

Gulf 8 Williams swabbed 288 bbl. in 24 hr. from Cypress sand at 2,307-17 ft.

Gulf 4 Williams pumped 500 bbl. from Cypress sand at 2,296-2,314 ft.

Gulf 5 Williams swabbed 500 bbl. from Cypress at 2,299-2,311 ft.

Gulf 6 Williams swabbed 420 bbl. in 22 hr. from Cypress at 2,297-2,318 ft.

Trans-Tex 1-B Burbank pumped 200 bbl. from McClosky lime at 2,700-14 ft. after acidizing.

Sinclair Prairie 10 Burbank pumped about 300 bbl. from Cypress sand at 2,294-2,304 ft.

Robards, Henderson County: Carter Oil 2 J. Denton, pumped 30 bbl. from McClosky lime at 2,506-10 ft., acidized.

Carter Oil 4 S. T. Denton, pumped 57 bbl. from Benoist sand at 2,347-69 ft.

Utica, Daviess County: Dale Goodson et al 1 McClellan, pumped 11 bbl. from Cypress sand at 1,326-38 ft.

Devonian Production Gaining in Importance

(Continued from Page 153)

will probably revive interest in Devonian exploration in the northern parts of the basin area.

Most promising of the recent discoveries is the Devonian production in the old Patoka field of Marion County. The discovery well was drilled by the Adams Oil & Gas Co. and a large initial production was indicated. However, the well produced about 25 per cent water and testing was discontinued immediately and a further study of fluid samples and the well log was made. This study indicated that the Devonian pay in this field was in contact with a water table of high encroaching tendencies. The well was then placed on pump and pinched down so that it could be pumped at a rate affording the minimum ratio of water to oil and thus conserve the water drive and its flushing effect on the lime pay. The well was completed on pump and on initial tests a 21-hour gage showed 100 bbl. of oil and 7 bbl. of water. This gage is no indication of the unrestricted potential of the well but it is the maximum rate at which it can be produced to obtain the greatest ultimate recovery.

This is the only Devonian well completed in the Patoka field to date but other tests are nearing the Devonian pay section. The Adams Oil & Gas Co. owns nearly 80 per cent of the acreage in the field, and it is justified, therefore, in observing all care in the development of the new Devonian reservoir.

The only Devonian discoveries drilled in the basin since 1937 have been in Fayette, Bond, Clinton, Marion and Washington counties. This area, shown in Fig. 1, is also the only area to receive extensive Devonian testing. No Devonian tests have been drilled in the deeper parts of the basin to the east and south of this area, but the search for Devonian production in the area is growing in intensity and will probably extend into the deep basin in the near future. Extensive exploration in the northern part of the basin will also probably be under way within another year due to the recent Christian County strike, for operators are beginning to realize that the Devonian is one of the greatest potential oil-producing reservoirs in Illinois and the near future will see many wildcat tests carried on to the Devonian and below in a search for new oil.

* LICENCED UNDER THE ROBT. O. SMITH PATENTS *

APRIL 1, 1943

COSCO

Franklin County Wildcat Flows Oil From Levias Lime

MATTOON, Ill.—A second pool opener within a month was indicated in Franklin County during the past week when the E. S. Adkins 1 Brown estate, SE NE NW 25-7s-2e, flowed 300 bbl. of oil in 22 hours from the Levias lime at a total depth of 2,875 ft. The well was treated with 500 gal. of acid. The 1 Brown estate is about 5 miles due south of production in the Benton field and about 2 miles due south of the West Frankfort pool, a single well pool. Both the Benton and West Frankfort pools produce only from the Tar Springs sand.

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OKLAHOMA

Cleveland County Deep Test Showing for Wilcox Discovery

PRINCIPAL interest of Oklahoma operators last week was the deep wildcat test in Cleveland County. Deep Rock Oil Corp. et al 1 Harris, NE NW NE 11-10n-1w, had hopes of finding production in the second Wilcox and at the first of the week were running 7-in. casing to bottom at 6,603 ft. to perforate and test. Late last week a drill-stem test in dolomite lime at 6,405-50 ft. recovered 350 ft. of oil and 300 ft. of wash water. Location of the well is about 9 miles southeast of the southern tip of the Oklahoma City field and successful completion of the well in the Wilcox zone would open an immense area for further testing. Nearest production is the small Newalla field a few miles to the northeast.

The majority of other wildcat operations were of a routine nature. In Tillman County, Kerlyn Oil Co. reopened and completed its 1 Hinson in NE SE 33-2s-17w. The well has been shut down from February to April. Drilled to 4,818 ft. in Arbuckle lime, a drill-stem test showed only mud and it was plugged back to 3,270 ft., then back to the casing at about 3,240 ft. and completed for 20 bbl. of oil through perforations at 2,673-95 ft., 2,924-35 ft., and 2,950-62 ft. in the Canyon and Cisco sand series.

Creek County. — The East Stroud pool was expanded by two comparatively large flowing wells in the Prue sand. J. J. Fleet completed both wells in 8-14n-7e; the 1 Charles flowing 140 bbl. a day at 2,852-82 ft. and the 1 Evans-Grimm making 264 bbl. a day at 2,861-95 ft. Two miles farther east Mid-Continent Petroleum 1 Foushee was a dry hole at 2,823 ft. The old Stroud pool has deeper production in various zones from 4,290-4,300 ft., the east extension being opened in the shallower sand in 1940.

Pottawatomie County. — Two new pools that got off to a good start had dry holes last week. Stanolind-Amerada 1 Crossland, NW NE NW 33-10n-2e, in the Lake Shawnee pool, found the Wilcox sand dry at 5,896 ft. and was given up at 5,993 ft. With the failure of this well, both the north and south offset locations to the discovery well are dry. The same interests' 1-B Bleeker, second test in the pool and the north offset, was dry at 5,971 ft. In the South McComb pool, the third and fourth wells were dry. Amerada 1 Webb, NW SE SE 29-8n-3e, a north offset to the discovery, found the Hunton dry at 4,662 ft. The west offset also found the Hunton dry at 4,712 ft. It was Continental Oil Co. 2 Weaver, NW NW NE 32-8n-3e.

OKLAHOMA COMPLETIONS

Wildcats

Cotton County: Stanolind 1 Moyer, NE NW 25-3s-12w, dry, T.D. 3,666 ft., Canyon 2,854 ft., Arbuckle 3,610 ft.

Creek County: Chas. Beal 1 Murray, NW NW NW 12-16n-7e, dry, T.D. 3,702 ft., Bartlesville 2,897 ft., Misener 3,696 ft.

Hughes County: W. A. Delaney 1 Eckles, SW NW SW 22-6n-8e, dry, T.D. 3,125 ft., Booch 2,568 ft., Gilcrease 2,800 ft.

Lincoln County: Big Chief Drlg. et al 1 Calvin, SW SW NE 3-15n-5e, dry, T.D. 4,418 ft., Layton 2,315 ft., Prue 3,360 ft., Hunton 4,200 ft., slight show oil, Viola 4,294 ft., Wilcox 4,307 ft., second Wilcox 4,394 ft.

Pawnee County: Ingling & Parker 1 Eyler, SW NE 23-23n-5e, dry, T.D. 3,080 ft., Prue 2,760 ft., Skinner 2,895 ft.

Tillman County: Kerlyn 1 Hinson, NE SE

(Continued on Page 175)

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Parkersburg and Salem Wells Find Higher and Lower Pay Horizons

MATTOON, Ill.—Kingwood Oil Co. deepened 20 Shanafelt, in the Salem field in Marion County, to Trenton lime topped at 4,554 ft., total depth 4,688 ft., and got a 72-bbl. production on the first 24-hour pumping test. The well was a big producer in the Devonian lime, 3 years ago.

Thirty-one wells were completed in the past week, 14 of which were dry. Only 23 new operations were started, including three wildcats, J. S. Pummell et al 1 Meyers, estate, NE NE SW 14-7n-1w, Fayette County; L. L. Wagoner et al 1 John Pilcher, C SW NW 13-5n-5e, Effingham County and Rockhill and Pure 1 Al Riggs, C NE NE 22-1n-8e, Wayne County.

Cypress sand production was uncovered in the Parkersburg pool in Richland and Lawrence counties in R. B. Martin and Central Pipe Line Co. 1 G. H. Ridgely in 31-2n-14w. The well made 70 bbl. in 24 hours, after a shot. McClosky lime has produced all the oil from this field heretofore and the well in question had been plugged back from the McClosky formation.

ILLINOIS COMPLETIONS

Wildcats

Madison County: McCullough Drilling 1 Blackett, SE SE NW 23-3n-5w, dry at 2,948 ft., St. Louis lime 1,045 ft., Louisiana at 2,021 ft., Trenton 2,852 ft.

Richland County: Benedum & Trees 1 A. J. Wharf, C NW SE 11-3n-10e, dry at 3,301 ft., Menard 2,328 ft., Waltersburg 2,406 ft., Vienna 2,460 ft., Tar Springs 2,470 ft., Glen Dean 2,574 ft. and 2,580 ft., Hardinsburg 2,596 ft., Golconda 2,660 ft., Barlow 2,746 ft., Weiler 2,817-2,922 ft., Benoist 3,002-38 ft., Renault 3,038 ft., Ste. Genevieve 3,128 ft., St. Louis 3,294 ft.

Wayne County: Armor & Hageman 1 Kumpp, SE NE SE 13-1n-9e, dry at 3,365 ft., Menard 2,396 ft. and 2,416 ft., upper Glen Dean 2,624 ft., Hardinsburg 2,666 ft., Golconda 2,744 ft., Barlow 2,846 ft., Cypress sand 2,872-88 ft., Weiler 2,913-97 ft., Paint Creek 3,002 ft., Benoist 3,044-78 ft., lower Renault 3,141-50 ft., Aux Vases, none; Ste. Genevieve 3,210 ft., McClosky 3,233 to 3,264 ft., broken.

Wabash County: C. W. Frazier 1 Stillwell, SW SE SE 7-1n-11w, dry at 2,045 ft., Benoist top 2,030 ft.

White County: Ryan Oil 1 Bisch, SW SE SE 30-3s-14w, dry at 3,063 ft., Biehl sand 2,277 ft., upper Kinkaid 1,908 ft., Menard 2,151 ft., Vienna 2,277 ft., Tar Springs 2,280 ft., upper Glen Dean 2,393 ft., lower Glen Dean 2,406 ft., Hardinsburg 2,437 ft., Golconda 2,497 ft., Barlow 2,610 ft., Cypress 2,621 ft., Weiler 2,655 ft., Paint Creek 2,766 ft., Benoist 2,771 ft., Aux Vases 2,901 ft., Ste. Genevieve 2,945 ft., Fredonia 3,000 ft., McClosky 3,021-25 ft. and 3,034-36 ft.

Fields

Allendale, Wabash County: E. Caudell C-2 Price, SW SE SE 23-1n-12w, pumped 100 bbl. oil and 20 bbl. water from Biehl sand at 1,453-56 ft., T.D.

W. E. Bailor 1 Cunningham, C W½ NW SW 26-2n-12w, pumped 115 bbl. from Biehl sand at 1,341-77 ft., (broken). T.D. 1,377 ft.

Barnhill, Wayne County: N. V. Duncan 1 Beam Consolidated, C NE SE 3-1s-8e, dry at 3,177 ft., upper Glen Dean 2,548 ft., Barlow 2,704 ft., Cypress sand 2,724 ft., Paint Creek 2,874 ft., upper Renault 2,957 ft., lower Renault 2,988 ft., Aux Vases 3,001-06 ft. and 3,011-17 ft., Ste. Genevieve 3,046 ft., lower O'Hara 3,056-74 ft., Fredonia 3,095 ft., McClosky 3,103-52 ft. and 3,112-19 ft.

Blairsville, Hamilton County: Magnolia 3 Travis, NE SW SE 20-4s-7e, (old well deepened) pumped 30 bbl. oil and 55 bbl. water from McClosky lime at 3,459-60 ft., T.D.

Boulder, Clinton County: H. A. Harmon 2 Reed, C SW NW 1-2n-2w, 335 bbl. oil and 7 bbl. water, Devonian lime at 2,698 ft., T.D. 2,781.

Cordes, Washington County: Magnolia 1 Dennis, SW SE SE 14-3s-3w, pumped 10 bbl. oil and 37 bbl. water, shot at 1,277-80 ft., T.D., Benoist sand top 1,254 ft.

Covington, Wayne County: Sun Oil 4 Mauck, C SW NW 20-1s-7e, (old well deepened), pumped 3 bbl. from O'Hara lime, T.D. 3,233 ft.

East Inman, Gallatin County: Cherry & Kidd 12 Kerwin, SW SW SW 11-8s-10e pumped 27 bbl. oil and 7½ bbl. water from McClosky lime 2,792-2,805 ft., acidized, T.D. 2,806 ft.

Iola, Clay County: Tide Water 8 Davis, SE SE NE 15-5n-5e, pumped 240 bbl. oil and 10 bbl. water, Benoist sand 2,269-96 ft. and Aux Vases sand 2,323-43 ft. T.D.

Texas 1 Joliff, NE NE SE 16-5n-5e, dry at 2,424 ft., old well deepened from 2,335 ft., Ste. Genevieve lime top 2,405 ft.

Luttrell et al 1 Reed heirs, SW NW NE 15-5n-5e, pumped 148 bbl. oil and bbl. water, shot at 2,337-70 ft., Benoist sand at 2,274-88 ft., Aux Vases at 2,336-70 ft., T.D.

King, Jefferson County: Texas 2 Bumpus, NE SW NW 34-3s-3e, Aux Vases sand shot at 2,730-40 ft., pumped 79 bbl. first day and 47 bbl. the second day.

E. V. Schultz 1 Modlin, NE SW SE 34-3s-3e, dry at 2,895 ft., Barlow lime 2,491 ft., Cypress at 2,526 ft., lower Renault 2,752 ft., Aux Vases at 2,766-75 ft.

Louden, Fayette County: Carter Oil 4 Miller, NW SE NE 16-8n-3e, pumped 27 bbl. from Cypress sand at 1,518-36 ft.. T.D. 1,601 ft.

Mason, Jefferson County: Kingwood 1 See-B, SW NE NE 34-6n-5e, pumped 30 bbl. from Aux Vases sand at 2,330-50 ft., T.D.

New Harmony, White County: Calstar Petroleum 49C H. C. Ford, NE NE SW 22-4s-14w, dry at 2,839 ft., shot at 2,608-16 ft.

Calstar 42C Miller Ford, NE NE NW 22-4s-14w, dry at 2,966 ft., Aux Vases top at 2,859 ft.

North Boos, Jasper County: Pure 1 Bergbower B, C NE SE 9-6n-10e, dry at 2,808 ft., Glen Dean 2,387 ft., Cypress

(Continued on Page 175)

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CALIFORNIA

Drilling Operations in Proved Fields Show Steady Increase

LOS ANGELES, Calif.—Drilling operations in proved fields throughout the state, reflecting the recent price advance in heavy grades of crude oil, are showing a general increase in both the number of new wells started and the scope of operations. Wildcat exploration, on the other hand, is not showing much change although in some areas where heavy oil might be expected there has been an improvement.

Fresno County.—The Cantua area was given another reversal last week by abandonment of a wildcat by Superior Oil Co. of California.

There has been no change in the status of Shell Oil Co., Inc.'s deep test in the middle of Tulare Lake and at 12,089 ft. the well still has a chance. The present formation is a sand and shale.

Sutter County.—Buttes Oilfields, Inc., which discovered a gas field in the Marysville Buttes district several years ago has consummated a deal whereby Shell will proceed with development work on the 14,000-acre block and any profits will be shared equally after drilling costs have been defrayed. The Marysville gas field credited to Walter Stalder of San Francisco, consulting geologist and engineer, is in Sutter County and gas production is from around a volcanic core. Four gas wells have been on production for several years and four others were drilled. It will be necessary to secure several exceptions from PAW before additional drilling can be done because the present requirement of one well to not less than 640 acres in gas fields cannot be made to apply at Marysville Buttes. The productive sand is located around the volcanic core and until the exact limits of the sand and core have been determined each well will be more or less of a wildcat.

Kern County.—Shell is preparing to complete its first well on the Parkford property in the South Belridge field and a second well will be tanking oil within a few days. Shell acquired this acreage from Parkford after the latter had drilled and completed seven productive wells at the south end of the South Belridge field. The South Belridge field calls for one well to 5 acres and for this reason Shell has a number of locations available.

General Petroleum Corp. has completed drilling operations on two wells at South Belridge that will extend the productive limits as soon as they go on the pump and these wells will prove up additional acreage for future drilling.

Honolulu Oil Corp. has cored 177 ft. of oil sand in 52 Fitzgerald in the Cymric district and when this well is completed the company will extend the productive limits of the present field which is a restricted area.

SAN JOAQUIN VALLEY COMPLETIONS

Antelope Hills wildcat district, Kern County: Chanslor Canfield Midway 12-1 Antelope fee, 12-28s-19e, abandoned in gray sand and shale, T.D. 5,001 ft.

Belridge, South, Kern County: Belridge Oil Co. 56-34 fee, 34-28s-21e, pumped 85 bbl., 12.9-gravity, 30 per cent cut, T.D. 785 ft., perf. 474-785 ft., South Belridge zone, Pleistocene.

General Petroleum Corp., 12-29s-21e, pumped 52 bbl., 13.9-gravity, 14 per cent cut, T.D. 1,130 ft., 140 mesh perf. 853-958 ft., 994-1,029 ft., completed in South Belridge zone, Pliocene.

Texas Co. 2 Wrightson fee, 12-29s-21e, pumped 20 bbl., 13.9-gravity, 40 per cent cut, T.D. 1,164 ft., perf. 1,045-70 ft., 1,130-40 ft., 1,160-64 ft., South Belridge zone, Pliocene.

Buena Vista Hills, Kern County: Standard 69-29-B fee, 29-31s-23e, pumped 24 bbl. 24.9-gravity, 70 per cent cut, T.D. 2,930 ft., P.B. 2,892 ft., 60 mesh perf. 2,846-2,929 ft., Gusher sand, Pliocene.

Standard 107-11-D fee, 11-32s-24e, pumped 8 bbl., 25.4-gravity, 6 per cent cut, 60 mesh perf. 2,736-2,800 ft., Buena Vista zone, Pliocene.

Union Oil Co. 16 McLeod, 34-31s-23 pumped 97 bbl. net, 26.9-gravity, 3 per cent cut, T.D. 3,631 ft., perf. 2,970-3,019 ft., 3,212-3,310 ft., 3,517-58 ft., 3,578-3,620 ft., Wilhelm and Gusher sand, Pliocene.

Cantua wildcat district, Fresno County Superior 54-36 Cantua, 36-17s-15e, abandoned, gray sand and shale, T.D. 10,729 ft.

Coalinga, East, Fresno County: Shell 148-26 fee, 26-19s-15e, pumped 99 bbl., 20.6-gravity, 1 per cent cut, T.D. 2,930 ft., perf. 2,565-95 ft., 2,730-2,810 ft., 2,825-90 ft., East Coalinga zone, Miocene.

Shell 182-32 fee, 32-19s-15e, pumped 139 bbl., 20.5-gravity, 38 per cent cut, T.D. 3,080 ft., perf. 2,952-90 ft., 3,030-58 ft., East Coalinga zone, Miocene.

Shell 156-34 fee, 34-19s-15e, pumped 210 bbl., 20.2-gravity, 0.2 per cent cut, T.D. 2,660 ft., perf. 2,267-2,407 ft., 2,438-47 ft., 2,467-2,655 ft., Coalinga zone, Miocene.

Standard 55-35-A fee, 35-19s-15e, pumped 32 bbl., 20.5-gravity, 0.1 per cent cut, T.D. 3,215 ft., P.B. 3,178 ft., 60 mesh perf. 3,067-3,173 ft, East Coalinga zone, Miocene.

Standard 61-35-A fee, 35-19s-15e, pumped 34 bbl., 20.7-gravity, 4 per cent cut, T.D. 3,350 ft., 60 mesh perf. 3,225-3,345 ft., East Coalinga zone, Miocene.

Fruitvale, Kern County: Western Gulf 15 Red Ribbon, 27-29s-27e, pumped 128 bbl., 17-gravity, 3.8 per cent cut, T.D. 4,438 ft., gun perf. 3,800-30 ft., 3,900-15 ft., 3,925-75 ft., 4,000-25 ft., 4,080-90 ft., 4,105-25 ft., 4,140-60 ft., Kernco zone, Pliocene.

Kern Front, Kern County: Standard 11-8 fee, 8-28s-27e, pumped 100 bbl. net, 14-gravity, 44 per cent cut, T.D. 2,910 ft., 100 mesh perf. 2,710-2,908 ft., M point 2,526 ft., N point 2,641 ft., Q point 2,712 ft., R point 2,765 ft., S point 2,835 ft., Kern Front zone, Pliocene.

Lodi gas field, San Joaquin County: Bankline Oil Co., 1-1 Community, 1-4n-6e, flowed estimated rate 5,000,000 cu. ft. dry gas daily, no oil, T.D. 5,765 ft., P.B. 2,383 ft., gun perf. 57 ½-in. holes 2,327-40 ft., bottomed in basement Schist, shut in.

Lost Hills, Kern County: Universal Consolidated 55 fee, 32-26s-21e, pumped 70 bbl. net, 17-gravity, 29 per cent cut, T.D. 1,750 ft., 80 mesh perf. 1,135-1,730 ft., Lost Hills zone, Pliocene.

Midway-Sunset, Kern County: Chanslor Canfield 56-9 fee, 9-32s-23e, pumped 75 bbl., 18.1-gravity, 10 per cent cut, T.D. 3,016 ft., 140 mesh perf. 2,919-3,000 ft., Midway-Sunset zone, Pliocene.

Richfield Oil Corp. 8 Fairfield, 11-31s-22e, pumped 65 bbl. net, 17.4-gravity, 61 per cent cut, T.D. 1,285 ft., perf. 1,160-1,265 ft., Midway-Sunset zone, Pliocene.

Standard 28-31-E fee, 31-12n-23e, pumped 160 bbl., 27.7-gravity, 0.6 per cent cut. T.D. 2,222 ft., 60 mesh perf. 2,199-2,220 ft., Midway-Sunset zone, Pliocene.

Rio Vista gas field, Solano County: Amerada 3 S. & S. J. D. D., 19-4n-3e, flowed estimated daily rate of 5,000,000 cu. ft. of gas, no oil, T.D. 4,365 ft., gun perf. interval 4,200-4,340 ft., shut in.

Riverdale, Fresno County: Amerada 56-22 Cerini, 22-17s-19e, abandoned in gray sand, productive intervals in other Riverdale wells were barren, T.D. 6,900 ft., two form. tests 6,797-6,812 ft. recovered no oil or gas.

Amerada 26-23 Hancock, 23-17s-19e, abandoned in gray sand, form. test 6,600-17 ft., recovered 725 ft. of mud, no oil or gas, packer failed on two tests of interval 6,636-58 ft., T.D. 6,900 ft.

Round Mountain, Kern County: Honolulu 56-X, 18-28s-29e, pumped 42 bbl., 16.5-gravity, 4 per cent cut, T.D. 2,006 ft., P.B. 1,942 ft., 100 mesh perf. 1,954-98 ft., Vedder zone, Miocene.

Honolulu 1 Round Mountain, 18-28s-29e, pumped 166 bbl. net, 14.2-gravity, 14 per cent cut, T.D. 1,892 ft., 100 mesh perf. 1,826-90 ft., Vedder zone, Miocene.

Trico Oil & Gas Co. 12 Coffee, 8-28s-29e, abandoned, stuck drill pipe 1,097 ft., T.D. 1,374 ft.

Round Mountain wildcat district, Kern County: Signal Petroleum 1 Mills, 24-28s-28e, abandoned in gray sand, upper Vedder, Miocene, 2,210 ft., lower Vedder 2,498 ft., Walker 2,521 ft., logged oil stained sand 2,488-90 ft., and 2,491-92 ft., T.D. 2,524 ft.

Strand, East, Kern County: Tide Water Associated 76-8 Kern County Land, 8-30s-26e, flowed 550 bbl., 39.8-gravity, 5 per cent cut, 300,000 cu. ft. gas, 24/64-in. bean, pressure 200/235 lb., T.D. 8,371 ft., P.B. 8,228 ft., perf. 8,160-8,228 ft., Stevens sand.

LOS ANGELES BASIN

Shell has recovered the fish in its deep test in the old Salt Lake field and is preparing to drill ahead. The log of this well to date has not shown anything of interest below the upper zones and considering its depth the outlook cannot be considered any too promising for production. It is believed that the hole is substantially below the equivalent of the Sentous zone of Miocene age which was the well's primary objective but no change has been made in original plans to drill the hole to the basement.

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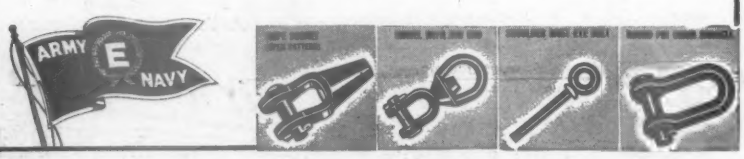

Orange County.—Drilling operations in the Huntington Beach field continue to show consistent increases and judging by new locations staked within the past 2 weeks conservative drilling may be anticipated for several months. Signal Oil & Gas Co. with one string of tools in operation has staked locations for five additional wells on the Bolsa lease and Southwest Exploration Co., with one well nearing completion, has four additional locations ready for future work. Standard has five available locations on the Huntington A lease. In addition to this work in the old section of the field, there are a number of wells being prepared for early work in the area east and north of the Four Corners district.

LOS ANGELES BASIN COMPLETIONS

La Mirada wildcat district, Orange County: Texas Co. 3-A McNally, 22-3s-11w, abandoned in gray barren sand, T.D. 9,535 ft.

Wilmington, Los Angeles County: Long Beach Oil Development 53-W Harbor, 3-5s-13w, flowed 51 bbl., 13.8-gravity, 4.2 per cent cut, 48/64-in. bean, pressures 15/200 lb., T.D. 2,531 ft., gravel packer perf. 2,337-2,423 ft., 2,448-2,529 ft., tar zone.

Yorba Linda, Orange County: Shell 8-15 Olinda fee, 15-3s-9w, pumped 128 bbl., 13.9-gravity, 2.3 per cent cut, T.D. 1,840 ft., P.B. 1,730 ft., perf. 1,545-1,728 ft., base conglomerate 1,473 ft, top oil sand 1,563 ft., Olinda zone, Pliocene.

COASTAL DISTRICT

Pacific Western Oil Co., on the basis of an electric log, has landed a string of 7-in. casing at 5,305 ft. in 20 Los Alamos in the Cat Canyon field, Santa Barbara County, and is drilling ahead. This well is scheduled for completion in the Los Flores zone of Miocene age. The company has location staked for 21 Los Alamos in 36-9n-33w. This work is in the southern part of the area undergoing development by Standard and Union Oil Co. Standard proved existence of Miocene production by a well drilled on its Los Flores property and Union, holding much acreage to the east, drilled and completed several wells on the Bell property. Union has started an offset to Pacific Western's 20 Los Alamos and both wells should reach the pay about the same time.

In the Orcutt district, Union is rigging up portable drilling equipment on 1 Hartnell, 23-9n-34w, preparatory to reentering the hole and attempting to return the well to production. This old well which has been abandoned for a number of years was one of the largest flowing wells completed in the Orcutt field back in 1904.

COASTAL DISTRICT COMPLETIONS

Crocker Springs wildcat district, San Luis Obispo County: Chanslor Canfield 1 Thomas, 1-31s-21e, abandoned in gray shale, top lower Miocene 6,850 ft., logged streaks of hard gray tight siltstone 5,852-7,581 ft., T.D. 9,188 ft.

Huasna wildcat district, San Luis Obispo County: Western Gulf 1 Huasna Community, 35-31s-14e, abandoned, gray sand, T.D. 3,015 ft.

(Continued on Page 175)

Offset to Hildreth Pool Opener Makes Good Well

WICHITA FALLS, Tex.—Continental Oil Co. 1 Kaneaster, east of the flush producer Caddo lime opener in the Hildreth pool of Montague County, flowed at the rate of 3,390 bbl. per day through ⅞-in. choke from lime pay at 6,076-6,118 ft. to take the interest in developments in the North Texas district. Stanolind Oil & Gas 1 A. A. Cobb, 7,600-ft. test 2 miles northwest of Bowie, was drilling below 3,800 ft. W. B. Omohundro 1 M. Fowler is a new 6,300-ft. wildcat location 5,877 ft. from the south line and 3,141 ft. from the west line of the R. M. Davis Survey, 7 miles southeast of Ringgold.

Archer County.—W. J. and J. J. Moran 1 Alvin Jentsch, Section 11, German Emigration Survey, swabbed 33 bbl. of oil and 5 bbl. of water in 24 hours from Ellenburger lime and was rigging up pump to put on production. Phillips Petroleum Co. 1 Luke, Section 117, A.T.N.C.L. Survey, was drilling below 4,400 ft. in shale.

Clay County.—Continental Oil et al 1 T. J. Stephens, G. W. Stipps Survey, topped conglomerate at 5,857 ft., with show of oil at 5,860 ft., and was drilling below 5,908 ft. A new wildcat test to go to 6,500 ft. is Continental 1 W. Hilburn, 779 ft. from the east line and 1,240 ft. from the north line of E. W. East Survey, 1 mile northeast of Shannon.

Jack County.—Continental 1 Weir, Kaltrider Survey, northwest of Jacksboro, promised to open a new pool from the Caddo lime topped at 4,724 ft. A drill-stem test from 4,737-71 ft. showed 60 ft. of gas-cut mud, and the test was drilling ahead at about 5,000 ft. to complete contract of 6,000 ft.

Grayson County.—Pump was being rigged up on the new pool opener in Grayson County, Burk Royalty Co. 1 Freeman, W. S. Reeves Survey. After plug was drilled from casing set at 1,375 ft. and the hole was deepened to 1,393 ft., it filled 400 ft. in 14 hours, then bailed five bailers of oil in 1 hour.

Wilbarger County.—British-American Oil Producing Co. 1 Cora Wilkinson, Section 103, Waggoner Colony subdivision, topped Ellenburger at 5,871 ft., no shows, and was drilling ahead. Tom Hunter 1 Oak Throckmorton is a new 6,000-ft. wildcat test in the southwest corner of Section 149, Waggoner Colony subdivision, east of the above test.

NORTH CENTRAL TEXAS COMPLETIONS

Wildcats

Archer County: Cochran & Cain et al 1 Abercrombie & Taylor, Sec. 1, S.P.R.R. Sur., dry, T.D. 1,950 ft.

W. H. Peckham 1 C. L. Abercrombie, Wm. Cound Sur., dry, T.D. 1,340 ft.

Cooke County: Akin & Dimock-Cochran & Cain 1 L. N. Ray, 990 ft. from easterly E, 990 ft. from northerly N, J. J. Coker Sur., dry, T.D. 2,506 ft.

Lucas et al 1 M. B. Rosson, Sec. 19, B.B.B.&C. Sur., Ab. 146, dry, T.D. 1,707 ft.

Jack County: Gwynn & Overby-Hanlon-Buchanan 1 J. B. Winder, 1,947 ft. from N, 3,958 ft. from W, E. Pearce Sur. A-467, dry, T.D. 5,224 ft.

Young County: British American Oil Prod. 1 Roach, 330 ft. from S & W Sec. 304 T.E.&L. Sur., Ellenburger 5,200-14 ft., dry, T.D. 4,214 ft.

Hassie Hunt 1 F. F. Shields, 660 ft. from S & W Sec. 446, T.E.&L. Sur., Caddo 3,754 ft., Mississippi 4,743 ft., Ellenburger 4,950 ft., dry, T.D. 5,442 ft.

Fields

Archer County: Jas. H. Smith 4-B Longly, 330 ft. from N, 400 ft. from E 80 ac. lease, Sec. 1839, T.E.&L. Sur., I.P. 5 bbl., pay 950 ft., T.D. 955 ft.

Hildreth, Montague County: Continental Oil 1 Kaneaster, 330 ft. from N & W Sec. 56, E.T. R.R. Sur., Caddo 6,025 ft., flowed 3,390 bbl., pay 6,076 ft., T.D. 6,118 ft.

Scotland, Archer County: A. R. Dillard 1 N. Schenck, 330 ft. from N, 990 ft. from E Sec. 20, Blk. 3, Clark & Plumb subd., elev. 939 ft., dry, T.D. 4,140 ft.

Sewell, Young County: Henry Zweifel 2 C. H. Holman et al, 660 ft. from S & W, J. M. C. Rogers Sur., Caddo 3,899-4,043 ft., dry, T.D. 4,043 ft.

Thornberry, Clay County: Fortex Oil 1 John C. Saner, Blk. 5, Wyatt sub., dry, T.D. 1,341 ft.

Sussex Oil 4 W. J. McInnes, 776 ft. from S, 990 ft. from W, Blk. 59, Byers Bros. subd., pumped 70 bbl., pay 1,300 ft., T.D. 1,308 ft.

Wilder Drlg. 4 C. T. Taylor est., Lot 41, Bacon subd., dry, T.D. 1,243 ft.

Vogstberger, Archer County: Tom D Medders and Walter Cline 1 Robt. Vogstberger, 467 ft. from S & E Blk. 2

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German Emigration So. Sur., flowed 692 bbl., pay 4,694 ft., shot 130 qt., T.D. 4,795 ft.

Wilbarger County: Phillips Pet. 11 W. T Waggoner est. "J. Bates," Sec. 43, Blk 4, H.&T.C. Sur., dry, T.D. 1,942 ft.

WEST CENTRAL TEXAS

ABILENE, Tex. — Fain & McGaha et al 1 Patterson, NW NW NE Section 20, Block 17, T.&P. Ry. Survey, a wildcat 2 miles north of the Wimberly pool, assured a new field when it filled 1,100 ft. in 7 hours from Tannehill sand from 2,195-2,203 ft. Seven-inch casing was run but not cemented, and a pumping test was attempted, but failed, and pipe will be cemented and a test made this week. The well was started as a Swastika sand test, scheduled to go 2,600 ft., testing all the seven pays present in the Wimberly pool. G. M. Gillespie 1 Roberts, Section 47, Orphan Asylum Land, east of Anson, had shows of oil from 2,125-29 ft., 2,150-55 ft., and 2,193-95 ft., which will be tested and the well carried on down to contract depth of 4,000 ft.

Stephens County.—J. D. Hancock 1 Black Brothers, Section 1144, T.E.&L. Survey, was shut in for storage. The well promises to be a good one judged from performance after perforating opposite Caddo lime at 3,250-69 ft. and treating with 4,000-gal. of acid, after which the well ran wild and was killed.

WEST CENTRAL TEXAS COMPLETIONS

Fields

Callahan County: Texas Mineral-Land Co. 4 Abrams, Sec. 1, B.B.B.&C. Sur., dry, T.D. 465 ft.

Morris, Coleman County: Anzac Oil 8 Morris, David Breeding Sur., I.P. 2 bbl., pay 2,184-91 ft., P.B. to 2,191 ft. from T.D. 2,684 ft.

Oplin, Callahan County: Hunter & Hunter 1 Jno. Windham, C W½ NW Sec. 145, Blk. 2, G.H.&H. Sur., elev. 1,838 ft., Caddo 3,378 ft., Ellenburger 4,046 ft., S.O. 4,080-82 ft., acid 6,500 gal., dry, T.D. 4,094 ft.

Strand, Jones County: Hunter & Hunter 1 Bettis, Sec. 2, S.F.I.W. Sur., elev. 1,576 ft., Palo Pinto 3,464 ft., S.O. 3,485-95 ft., dry, T.D. 3,686 ft.

Old Well Drilled Deeper

Prichard, Callahan County: Anderson-Prichard 2 Sealy-Smith, 1,980 ft. from N, 2,130 ft. from W Sec. 121, Blk. 2 G.H.&H. Sur., elev. 1,981 ft., Caddo 3,707 ft., S.O. 3,795-3,818 ft., Ellenburger 4,280 ft., dry, deepened from 3,094 to 4,315 ft.

California Fields

(Continued from Page 172)

Santa Maria Valley, Santa Barbara County: Union 18 Union Sugar, 15-10n-35w, pumped 162 bbl., 16.9-gravity, 4.8 per cent cut, T.D. 5,275 ft., 180 mesh perf. 5,064-5,273 ft., Monterey, Miocene.

San Martinez, Los Angeles County: Herley & Kelley 1 Handy, 18-4n-17w, pumped 150 bbl., 32.8-gravity, 3 per cent cut, T.D. 5,973 ft., perf. at intervals 5,660-5,775 ft., Vasquez and Videgain zones, Miocene.

Shiells Canyon, Ventura County: Seaboard 2 Calumet, 3-3n-19w, abandoned, gray sand, T.D. 5,188 ft., only minor showings.

MICHIGAN

Production Remains Well Below Quota, Many Dry Holes

SAGINAW, Mich. — With one dry hole after another showing up in last week's drilling completions report, 10 out of 12 completions, Michigan oil interests displayed concern over the future of the industry as predictions again were made that May production will continue below both demand and the quota as fixed by the federal petroleum coordinator.

After a conference with P. J. Hoffmaster, supervisor of wells, the state Oil Advisory Board estimated May demand would amount to 64,663 bbl. of crude oil per day, whereas the outlook is for an output of only 56,176 bbl. a day against a quota of 66,100 bbl. While figures for the week ended April 7, showed Michigan producing 58,680 bbl. a day, a slight gain over March figures, there was a difference of opinion whether the rate could be maintained, particularly in view of last week's disappointing showing. Eight of the 10 dry holes were wildcat explorations.

The oil board set May 19 for a public hearing at which to review proration and discuss production problems. Upon recommendation of the board, Hoffmaster asked producers in the Prosper field in Aetna township, Missaukee County, to limit production to 262½ bbl. a day. The request may become an order after a hearing to be conducted soon. In calling the general hearing, Hoffmaster said "there are indications some fields are producing too much for the benefit of ultimate production."

Only six additional drilling permits were issued by the state Conservation Department, making the 1943 total 133. Two are for locations in Osceola County, two in Mecosta, one in Missaukee and one in Allegan.

MICHIGAN COMPLETIONS

Antrim County, Chestoma Township: Ohio Oil Co. 1 East Jordan Lumber Co., C W½ NW SE 3-30n-6w, wildcat, dry, T.D. 1,923 ft.

Warner Township: Ohio Producers, Inc. 1 White, NW NW SE 31-31n-5w, wildcat, dry, T.D. 1,770 ft.

Huron County, Bloomfield Township: Wallace Markle 2 Johnston, NE SW SE 8-17n-14e, wildcat, dry, T.D. 2,645 ft.

Ingham County, Meridian Township: Voorhees Drilling Co. 1 Kirkpatrick, C N½ SW SW 22-4n-1w, wildcat, dry, T.D. 2,833 ft.

Lake County, Cherry Valley Township: Oil Producers, Inc., 1 Woods, NE SE SE 24-18n-12w, wildcat, dry, T.D. 4,553 ft.

Mecosta County: Fork Township: Belvidere Oil Co. 1 Schooley, communitized, NW SE SE 3-16n-7w, wildcat, dry, T.D. 1,510 ft.

Missaukee County, Aetna Township: Gulf Refining Co. 2 Buning, C S½ NW NW 35-22n-6w, 110 bbl., natural, T.D. 3,851 ft.

Norwich Township: Sun Oil Co. 4 Horner Trustee, C S½ SE SW 11-24n-5w, swabbed 35 bbl., natural, T.D. 4,475 ft.

Osceola County, Cedar Township: Ohio Oil Co. 1 Benzing, C S½ SE NW 34-18n-9w, wildcat, dry, T.D. 3,816 ft.

Highland Township: C. L. Maguire, Inc. 1 Bloemsma, C S½ SW SE 20n-8w, wildcat test, dry, T.D. 1,897 ft.

Middle Branch Township: Pure Oil Co. A-1 Jones, C N½ NE NE 24-19n-7w, dry, T.D. 4,075 ft.

Osceola Township: Sun Oil Co. 1 Snyder-Gruber et al, C N½ SW SW 27-18n-8w, dry, T.D. 4,023 ft.

Illinois Fields

(Continued from Page 169)

2,455 ft., Ste. Genevieve 2,690 ft.

North Sims, Wayne County: Pure 4 E. Talbert, SW NW NW 17-1s-6e, pumped 46 bbl. from Aux Vases sand at 3,003-25 ft., T.D.

Oblong, Lawrence County: Oblong Development 1 Lewis, C E½ NW NW 9-6n-13w, dry at 1,960 ft.

Phillipstown, White County: Jarvis & Marcell 8 Garner, NW SE NW 31-4s-11e, pumped 20 bbl. from Bridgeport sand 1,458-76 ft., T.D.

Salem, Marion County: Kingwood 20 Shanafelt, 270 ft. from E and S lines SE NE NE 20-2n-2e, an old Devonian well at 3,413-46 ft. completed Jan. 3, 1940 for 3,720 bbl., drilled to 4,688 ft. and acidized, swabbed and flowed 114 bbl. in 11 hours, then flowed 72 bbl. in 24 hours. Trenton lime at 4,554 ft., T.D. 4,688 ft., liner perforated at 4,652-54 ft. with packer set at 4,580 ft.

South Bible Grove, Clay County: Sinclair-Wyoming 1 Hardin, SE SE NW 20-3n-7e, dry at 2,765 ft., Aux Vases sand at 2,741-48 ft., shot.

Walpole, Hamilton County: Texas 3 Shasteen, NW SE SW 27-6s-6e, pumped 32 bbl. oil and 20 bbl. water, Aux Vases sand at 3,058-65 ft. and 3,070-77 ft., shot at 3,075-3,105 ft., T.D.

West Frankfort, Franklin County: E. S. Adkins 3 Peabody Coal, SW NW SW 18-7s-3e, pumped 85 bbl. from sand topped at 2,032 ft., T.D. 2,070 ft.

West Inman, Gallatin County: L. B. Martin 1 Mage-A, NW NW NE 15-8s-9e, dry at 2,540 ft.

West Mt. Carmel, Wabash County: Dean & Morton 1 Hewins, SW SE NE 14-1s-13w, dry at 2,350 ft., dry at 2,350 ft., Tar sand 1,984 ft., upper Glen Dean 2,092 ft., Hardinsburg 2,129 ft., Golconda 2,185 ft., Barlow 2,290 ft., Weiler 2,333-50 ft., T.D.

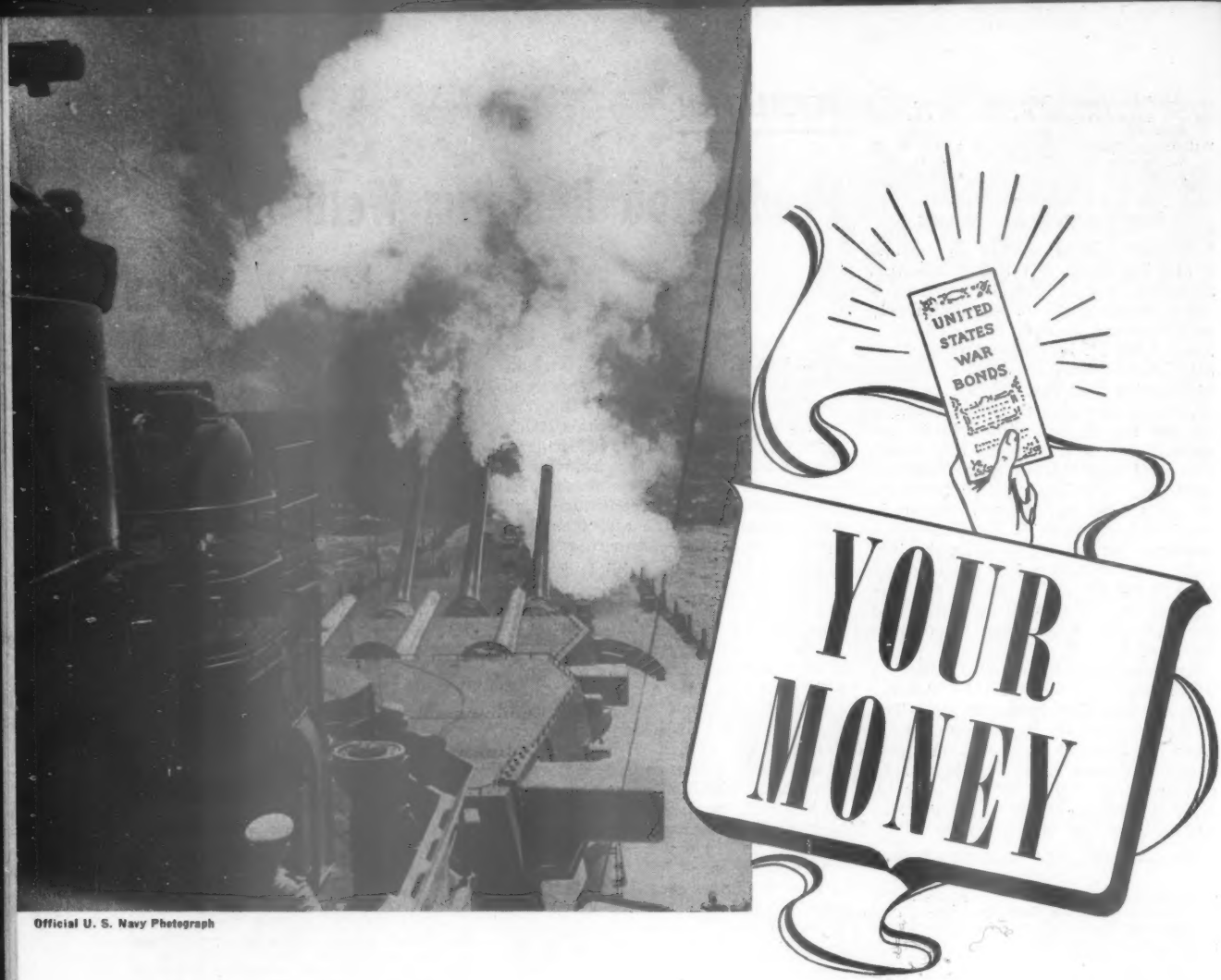
Oklahoma Fields

(Continued from Page 163)

33-2s-17w, pumped 20 bbl., T.D. 4,818 ft., perf. in sand 2,673-95 ft., 2,929-62 ft.

Fields

Crescent, Logan County: Continental 2 Mey-



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ers, SW SW SW 26-17n-4w, dry, T.D. 4,992 ft., Layton 4,931 ft.

Cromwell E, Okfuskee County: Chapman-McFarlin 4 Deatherage, SE NW SE 1-10n-8e, flowed 425 bbl., Misener 3,966-74 ft., T.D. 4,004 ft.

Cumberland, Marshall County: Pure Oil 1 Williams-312, SE NW SW 21-5s-7e, flowed 215 bbl. in 4 hr., sand 5,781 ft., T.D. 5,886 ft.

Pure Oil 5 Metz-105, SE NW NE 29-5s-7e, flowed 215 bbl. in 4 hr., sand 5,908 ft., T.D. 6,012 ft.

Pure Oil 2 Myers-110, SE SW NE 34-5s-7e, flowed 52 bbl. in 4 hr., T.D. 5,788 ft.

Elgin, Comanche County: Texas 1 Spencer, NW NW 8-3n-10w, flowed 75 bbl., sand 790-812 ft., T.D. 1,120 ft.

Lake Shawnee, Pottawatomie County: Stanolind-Amerada 1 Crossland, NW NE NW 33-10n-2e, dry, T.D. 5,993 ft., Wilcox 5,896 ft.

McComb, Pottawatomie County: Amerada 1 Webb, NW SE SE 29-8n-3e, dry, T.D. 4,743 ft., Hunton 4,662 ft.

Continental 2 Weaver, NW NW NE 32-8n-3e, dry, T.D. 4,880 ft., Hunton 4,712 ft.

Navina, Logan County: Cities Service 1-B Underwood, NW SW 11-15n-4w, flowed 19 bbl., Layton 4,994-5,010 ft., T.D. 5,054 ft.

Stroud, Creek County: J. J. Fleet 1 Charles, NW SE 8-14n-7e, flowed 140 bbl., sand 2,852-82 ft., T.D. 2,891 ft.

J. J. Fleet 1 Evans-Grimm, SW NE 8-14n-7e, flowed 264 bbl., Prue 2,861-95 ft., T.D. 2,898 ft.

Mid-Continent 1 Foushee, SE SW NW 10-14n-7e, dry, T.D. 2,823 ft.

Tonkawa, Kay County: Ingline & Parker 1 Williams, SE NW SE 29-25n-1w, pumped 7 bbl., Mississippian chat 4,193-4,270 ft., T.D. 4,335 ft.

Velma, Stephens County: Skelly 16-B Stiefel, SW SW NE 35-1s-5w, pumped 7 bbl. in 6 hr., T.D. 749 ft.

Skelly 2-D Selby, SE SE 26-1s-5w, flowed 286 bbl., 45-gravity, oolitic limestone 7,485-7,556 ft., T.D. 7,605 ft.

Wynona, Osage County: Barnsdall No. 10, NE SW SW 30-24n-10e, pumped 50 bbl., sand 2,100-31 ft.

Miscellaneous

Creek County: Texas 1 Catlett, NE NW NE 35-17n-10e, dry, T.D. 2,884 ft., Wilcox 2,866 ft.

Lincoln County: Danciger 1 Humphrey, SE SW SW 30-17n-4e, dry, T.D. 3,973 ft., Bartlesville 3,951 ft.

Okmulgee County: Wise Drlg. 1 Grayson, SW SE NW 26-14n-11e, dry, T.D. 2,905 ft., Wilcox 2,894 ft.

Seminole County: Wood Oil 1 Strothers, SW NW SE 28-9n-6e, dry, T.D. 4,242 ft., Wilcox 4,131 ft.

Tulsa County: B. K. Chickester 2-A Berry, NE NW SE 29-17n-13e, dry, T.D. 1,774 ft.

Appalachian Fields

(Continued from Page 165)

1,780,000 cu. ft. gas, Thirty-foot sand gas at 3,234 ft., T.D. 3,238 ft.

Putnam County, Curry district: Pate Gas Co. 2 Gladys Alford, 231,000 cu. ft. gas, Berea sand at 2,147 ft., T.D. 2,181 ft.

Wayne County, Butler district: Chartiers Oil Co. 1 Ida Dena Perdue, 1,476,000 cu. ft. gas, Corniferous lime, T.D. 3,608 ft.

Wood County, Walker district: Clifton Oil & Gas Co. 5 Volcanic Oil Co., 7 bbl., Berea 851-900 ft., T.D. 1,546 ft.

ORISKANY GAS FIELDS

Jackson County, Ripley district: Columbian Carbon Co. 694-D Eastern, 610,000 cu. ft. gas after shot, Corniferous lime 4,756 ft., Oriskany 4,864-4,904 ft., lime break; Oriskany 4,913-23 ft., T.D. 4,933 ft.

NORTH LOUISIANA, ARKANSAS

Bossier Parish Wildcat Has Oil in Shallow Sand

SHREVEPORT, La.—Discovery of new shallow production in Bossier Parish, with a possible 6-mile extension to the large Caddo-Pine Island field, was reported last week. C. W. Beene and Robert Ehrhardt 1 Fenet in 25-21n-14w, filled some 250 ft. with oil in the Nacatoch sand near the 1,000-ft. level and was estimated to be good for 50 to 75 bbl. of oil a day. Location is east of the Pine Island area, across the Red River.

Caddo Parish.—Owens & Harris 1 Fuller, a deep Pettit lime test located in 4-22n-14w, about 2 miles southwest of the town of Mira and north of the Hosston pool, was reported to be pumping 150 bbl. of oil a day. Perforations and an acid treatment were made in the lime at 5,800 ft. Previously the well was said to be making only a small amount of low-gravity oil.

In Bossier Parish, Hunt Oil Co. attempted further tests on its 1-A Pardee, a wildcat 3 miles southeast of the North Carterville pool. An acid attempt failed through perforations at 5,978-6,014 ft. and another test will be made in a higher zone. This well was previously reported as dry.

In Arkansas, the Oil and Gas Commission announced permits for nine new wells, including four wildcats. Two wells are to be in the new Haynesville pool and three in the Stephens field. Wildcat locations are Placid Oil Co. 1 Bodcaw Lumber, 18-14s-28w, Nevada County; Carter Oil Co. 1 Strohacker, 3-15s-27w, Miller County; Jack Carnes 1 Roth & Carter, 35-13s-18w, Ouachita County; and Barnsdall Oil Co. 1 Shultz, 34-13s-26w, in Hempstead County. There were no Arkansas completions reported last week.

NORTH LOUISIANA COMPLETIONS

Wildcats

Carroll Parish: Continental Oil 1 Causey, SW SW 10-20n-9e, dry, T.D. 2,882 ft. in chalk.

Sabine Parish: Seaport Oil 1 J. K. Phares, S½ NW SW 4-5n-12w, dry, T.D. 2,493 ft.

Fields

Calvin, Winn Parish: H. L. Hunt F-25 Goodpine, NE SW 12-12n-5w, dry, T.D. 6,207 ft.

Haynesville, Claiborne Parish: Midstates Oil 2 V. E. Lowe, approx. SW SE 5-23n-8w, flowed 251 bbl. in 10 hr. through choke, Pettit 5,436-46 ft., T.D. 5,502 ft.

Logansport, De Soto Parish: Southern Production 2 Frost Lumber, NE SW NE 7-11n-15w, 46,000,000 cu. ft. gas, open flow, 2,260 lb. R.P., perf. 4,894-4,904 ft., 4,906-18 ft., 4,926-34 ft., T.D. 4,961 ft.

Pine Island, Caddo Parish: Bayou State Oil Corp. 1 Chiles, SW NE NE 36-22n-16w, pumped 6 bbl., T.D. 1,069 ft.

Trout, La Salle Parish: H. W. Todd 2-A J. L. Whatley, NE SE NW 19-8n-3e, dry, T.D. 3,815 ft., Wilcox 2,293 ft.

Willow Lake, Catahoula Parish: Roy L. Fisher et al 1 Rhone, 37-8n-7e, dry, T.D. 5,870 ft., Wilcox 3,792 ft.

MISSISSIPPI

JACKSON, Miss.—Pure Oil Co. 1 J. M. McDowell, 1-6n-4w, Adams County, was milling on windows to sidetrack at 10,150 ft. Humble Oil & Refining Co. 1-B L. N. Dantzler Lumber Co., 20-5s-8w, Jackson County, was at 9,362 ft. in shale and preparing to take sidewall cores. It topped the Massive Tuscaloosa at 8,572 ft. Gulf Refining Co. has staked location for 1 H. M. Osborne, 19-8n-4e, which, it is reported, will be a shallow test. California Co. 1 G. T. Smith, 4-7n-7e, Lincoln County, was at total depth of 12,229 ft. in shale. No shows were reported from a drill-stem test around 11,500 ft. It was planned to perforate a few feet deeper and retest. Richard W. Norton, Jr., 3 L. N. Dantzler Lumber Co. 10-4s-10w, Stone County, was drilling at 8,270 ft. in sand and shale. Gulf was moving in rig for 1 Aden Davis, 2-9n-9w, Wayne County.

MISSISSIPPI COMPLETIONS

Wildcat, Simpson County: Gulf Ref. Co. 4 Wilbe Lumber Co., NE NE NE 8-2n-4e, dry, T.D. 9,500 ft.

Pickens, Yazoo County: Sinclair Wyoming Oil Co. 7 Wilburn, SE NW 32-12n-3e, flowed 288 bbl., pay 4,830-43 ft., T.D.

Forest City Basin

(Continued from Page 161)

Dawson pool, was drilling below 1,900 ft., looking for Mississippi limestone.

R. L. Ferguson and Edward Towle, who are drilling a wildcat test 2 miles northeast of Verdon in NW NW NE 2-2n-15e, Richardson County, perforated casing a fourth time opposite the Hunton lime and were preparing to reacidize. Previous perforations and acidizations brought some oil, but not in commercial quantities.

A Missouri wildcat test 2 miles south of the Cities Service Oil Co. 1 Cook discovery well, was shut down because of a broken mud pump. This is the O. R. Newcomer et al 1 Joseph Acock in SW C SE NW 8-64n-39w, Atchison County, Missouri. Total depth was 1,285 ft. Bartlesville sand, the test's objective, is expected at about 1,450 ft.

Trend of Manpower Charted at A.P.I. Meeting

(Continued from Page 57)

000 women will be employed in all types of work. Every possible method must be applied by all industries to get the highest utilization from the labor pool. Women will replace many men. Racial minority groups and handicapped workers will have to be used and training programs speeded up.

"It would be well, in thinking about manpower problems in connection with the oil industry, to take cognizance of the fact that the armed forces have a first mortgage on every male of military age who is physically fit for duty. These men are merely on loan from the Army and Navy, and it is a call loan that can and is quite likely to be liquidated at any moment."

Deferments No Reflection

Mr. LeBlanc pointed out that the oil industry had been especially hard hit because of the type of men engaged and because executives seemed to regard it as a reflection on their patriotism to apply for a deferment. As a result some brave and capable fighting men are in the Army and Navy who probably would be rendering a more valuable service in synthetic-rubber or aviation-gasoline plants.

All industries have their peculiarities, the same as the oil industry, Mr. LeBlanc's paper said, but the solution of many manpower problems can be facilitated by closer cooperation with WMC. Due to relatively high wages prevailing in the oil industry, it has not been found necessary in the past to utilize facilities of the U. S. Employment Service, but this agency has been useful to other industries. The oil industry faces a heavy additional demand on its manpower because 10,000 men will be required in synthetic-rubber plants in Louisiana, New Mexico, and Texas, where over half of the plants of this type are located.

The organization and the decentralized functioning of the WMC were outlined by Mr. LeBlanc, and he added that it was no longer possible for each employer to "go it alone." He discussed the success of various training programs and reported that other industries, which originally thought it would take 1 to 2 years to develop personnel, had found by experience that scientific job breakdown, utilization of less skilled workers, upgrading and in-plant training resulted in a supply of replacement workers in 2 or 3 months.

The oil industry, being older than many war industries, is not so wasteful of labor, but there is room for improvement and reexamination of practices. Unfortunately, while the oil companies have fairly large personnel departments and rather large reservoir of figures, there is a substantial lack of accurate information available on the skills of their workers.

Recent action of the WMC to speed the flow of workers into essential industry was reviewed by Mr. LeBlanc. This action prohibits the hiring of any worker already in an essential industry either by another critical industry or by a nonwar employer at a higher rate of pay than he received in his previous employment. It should be noted, he said, that there is nothing which forbids the employment of a person holding a nonwar job by a war-production employer at a higher wage. Stabilization agreements are being made in various areas to limit job shifting to three causes: (1) Discharge of a worker. (2) When the worker is laid off for a period of 7 days or more. (3) When the fact is established that his highest skill is not being employed.

"Planned transfer, which will take men from plants and activities where they can best be spared to other plants and activities where they are most needed is the common-sense answer to the present situation where an employer can only get labor at the expense of another," Mr. LeBlanc said.

Skills Considered in Transfers

Relative efficiency with which the worker's skill will be employed will be taken into consideration in making such transfers.

Reliance of the industry on its own program for solving the manpower situation was suggested by F. H. Harbison, labor councilor of PAW, although he assured those present that PAW considered the present condition as serious and was working on the problem with the WMC. Suggestions on how to alleviate some of the difficulty will shortly be forthcoming from PAW, according to Mr. Harbison. He is a former professor of economics at Chicago University.

That all was not clear sailing in the oil industry was evidenced by the questions following the paper to which Mr. Martin and Lt. Col. A. J. Lewis, WMC, Dallas, responded. These questions and answers brought out that a technical man could obtain his release from the armed services by applying through his company commander for transfer to the Reserve Corps, that there was no recommended length of the work week in the oil industry, that workers must have certificates of availability (for which there is no prescribed form) from the former employer before they can be given employment, and that all employers should obtain WMC Bulletin 23, as amended March 1, 1943, for a list of deferable occupations. Colonel Lewis pointed out that occupational shortages change and it must be shown that there is a shortage of people to do a particular job.

"Technical Manpower Needs for Oil Production" was discussed in a paper by Harry H. Power, the University of Texas. He went into the capacity of the various institutions in the nation to develop technical men, the requirements of the oil industry for technicians, the rate of withdrawal of such men, training of less educated personnel to perform routine tasks, and the accelerated technical-training program. There is little doubt that the oil industry is facing a technical-manpower shortage and a rational basis for planning for the most effective training and use of the limited technical manpower is extremely urgent, Mr. Power said.

Vocational Program Explained

Operation of the vocational training program inaugurated 10 years ago by the A.P.I. and the board of education of Texas and Oklahoma was discussed in J. R. D. Eddy's paper, "Utilization of Existing Vocational Training Methods and Facilities for Wartime Conditions in the Oil Industry." A three-point program was offered by Mr. Eddy:

1. Services will be made available for the training of selected personnel to be foremen-conference leaders and the continuous training of foremen.
2. Use of approved courses to upgrade employed personnel.
3. The plan of the U. S. Office of Education of the part-time trade preparatory program in which a selected group of people is trained to enter employment with a petroleum company. Mr. Eddy is director of vocational training, state Board of Education, Austin, Tex.

The first day of the program was devoted to the materials situation and to wartime operational changes. The paper by T. E. Swigart, president of Shell Pipe Line Corp., Houston, was read by H. H. Anderson, vice president of that company. This paper brought out that to offset the staggering transportation loss of 1,450,000 bbl. in daily tanker deliveries to District 1, tank-car shipments have been increased from negligible quantities to over 800,000 bbl. daily. Barge deliveries have risen from 54,000 to 200,000 bbl. daily and together these account for over 1,000,000 bbl. per day going to the East Coast. The cooperative government-industry pipeline program has been little short of phenomenal and has resulted in increasing shipments to District 1 by this method from a nominal daily quantity of about 45,000 bbl. in 1941 to 500,000 bbl. by the end of 1943. When the War Emergency Pipeline, Inc., 20-in. artery is completed deliveries should exceed over 600,000 bbl.

Available transportation methods

are now delivering into District 1 more than 1,250,000 bbl. per day without any tank-ship movements. Operation of the two WEP projects, together with further improvements in industry-owned lines, should raise the total deliveries by inland and overland carriers to more than 1,600,000 bbl. daily by the end of this year.

In addition to outlining the present protective program which includes the continuous-security branches of the service commands, Kraus Earhart, director of the Facility Security Division, PAW District 3, discussed the necessity of everyone being on the alert to prevent sabotage and accidental damages and fires in petroleum installations in his paper, "Wartime Protection of Petroleum Facilities." P. J. Jolly, safety supervisor, Texas Co., Houston, collaborated on the paper.

The source of steel, its raw ingredients and its use in the petroleum industry were discussed by V. J. Martzell in his paper, "The Conservation of Steel in Oil Production and Transmission." Substitution of lower grades and other materials, use of obsolete stocks, reducing of safety factors, protection of material in use and in the warehouses and adequate salvage and repair programs were recommended.

Cooperative Standardization Work

An outline of the cooperation of the standardization committee of A.P.I. with the WPB in the simplification and reduction of material lists to facilitate manufacturing operations and reduce steel consumption was contained in the paper by C. A. Dunlop, Humble Oil & Refining Co., Houston, "A.P.I. Activities and Cooperation With the War Production Board in the Simplification of Steel Specifications and Steel Conservation." The work, activities and progress of the A.P.I. standardization committees was also discussed.

J. F. Lucey, Lucey Petroleum Co., Dallas, urged that standards in the industry be maintained and that every effort be made to keep them abreast of developments in the coming years. He also reviewed the history of standardization in his paper, "A.P.I. Standards—Past and Future."

Evolution of priorities regulations through the preference ratings and production-requirements plan to the present controlled-materials system, with its direct allocation, was discussed by David G. Hawthorn, Production Division, PAW, in his paper, "Materials for the Production of Oil Through the Controlled Materials Plan." He outlined the present organization, pointing out that PAW is the claimant agency for the petroleum industry and is charged with the development of requirements of all material and facilities for the industry and is responsible for seeing that the materials and facilities which are made available to the petroleum industry are properly and efficiently distributed. The particular responsibility of the Equipment Section of the PAW Production Division is to determine the requirements of equipment for the production branch of the industry.

Officers elected for the coming year at the Friday morning session were:

D. V. Carter, chairman, Magnolia Petroleum Co., Dallas; Fred Shields, vice chairman for Texas Gulf Coast, Shields Oil Co., San Antonio; R. Kyner, vice chairman for East Texas, East Texas Engineers Association, Kilgore; J. H. House, vice chairman for West Texas and New Mexico, Humble Oil & Refining Co., Midland; C. F. Patterson, vice chairman for North Texas; M. L. Euwer, vice chairman for South Louisiana, Union Sulphur Co., Sulphur; V. J. Martzell, vice chairman for Arkansas and North Louisiana, United Gas Pipe Line Co., Shreveport, La.; G. H. Card, vice chairman for North Central Texas, Stanolind Oil & Gas Co., Fort Worth; and A. W. Baucum, secretary-treasurer, Texas Co., Houston.

Standard of New Jersey Organizes Scrap Drive

(Continued from Page 59)

as shown in the cumulative totals for December is given below:

	Long tons	Pounds
Ferrous materials	41,477.3	.....
Nonferrous materials*	.....	1,068,698
Rubber	.....	†407,007
Paper	.....	1,020,179
Miscellaneous	.....	‡753,803
Total	41,477.3	3,249,687

*Copper, brass, bronze, etc.

†Does not include collections from public at service stations.

‡Includes tin cans, steel turnings, aluminum, lead, batteries, rope, etc.

Thus, the December report reveals that almost 100,000,000 lb. of scrap were collected and disposed of in 1942 by the domestic affiliates of Standard Oil Co. (New Jersey) in this campaign. These reports, incidentally, are sent to the petroleum unit of the Industrial Salvage Branch of WPB before the twenty-second of the following month. Reports for individual companies are due at the coordinating office before the fifteenth. The desirability of this type of report is indicated by a letter of acknowledgment received from the head of the petroleum unit which stated. "The report that you enclosed is very gratifying indeed and we are particularly appreciative of the method in which you transmit the information."

In order to make the program as thorough as possible both with respect to salvage and waste-elimination suggestions from employes were invited. In one refinery 121 suggestions were received in a 2-month period. These suggestions ranged from laundering of canvas filter bags by outside laundries to conserve the canvas to a review of agitator corrosion data which determined that maintenance of lead linings was not justified. The latter conclusion saved the installation of 50 tons of lead in two agitators and made available 30 to 35 tons of scrap lead. Gathering scrap in outlying districts was assigned to some medically restricted employes during periods of recuperation.

Navy Seeks Oil Men to Serve as Officers

The Office of Naval Officer Procurement has announced that it is seeking men who can qualify as officers in connection with its program for petroleum specialists. Successful candidates will be commissioned and assigned to duties in connection with petroleum pools already established or about to be established both within and beyond the continental limits of the United States.

Engineers and technical men in the oil industry are needed as commissioned officers for many important billets in the U. S. Naval Reserve. Previous military experience is not required. Men are needed as:

Oil refinery engineers.—Rehabilitation of oil refining facilities.

Petroleum engineers.—Operation of refineries, inspection, development and application of new products.

Radar officers.—Research, design, inspection, instruction, maintenance, repair and installation of high-frequency electronic-detection equipment.

Maintenance officers. — Assembly, maintenance and repair of ordnance equipment or aircraft engines.

Operating officers. — Engineering duties afloat.

Mine Warfare.—Inspection, maintenance and repair of equipment used in mine warfare.

Construction battalion officers.—Advance base construction outside the continental limits of the United States.

Men having a background in mathematics, or physics may be qualified for other assignments.

Ohio Oil Co. Advances Elk Basin Heavy Crude

FINDLAY, Ohio. — Ohio Oil Co., acting pursuant to Amendment 94 to Revised Price Schedule 88, last week advanced its posted price for Elk Basin, Wyo., heavy crude 8 cents per barrel to a flat price of 90 cents. The advance was effective at 7 a.m., April 28.

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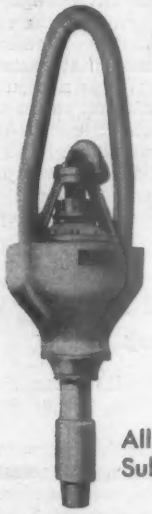

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Among the Drilling Contractors

Two States Drilling Co., Dallas, Tex., has received contract to drill Union Oil Co. of California 1 J. D. Biles, C NW NE 18-A31, P.S.L. 4½ miles northwest of the Fullerton field, Andrews County, West Texas, which produces from the Tubb pay in the lower Permian. Contract calls for testing to 7,400 ft. Union has acquired 1,440 acres in the area centering around the new wildcat location.

Richmond Drilling Co., Midland, Tex., has assigned two strings of tools to new locations in the South Cowden pool, Ector County, West Texas. The company will drill 3 Lyda Mae Johnson in 32-42-2s, T.&P.R.R. Survey and 2-A Ressie Maurice in another part of the same section.

Goldrus Drilling Co., Houston, Tex., will drill for Pitkin-Goldston Oil Co. a 7,800-ft. Wilcox sand test 3 miles west of Nordheim, De Witt County, Texas, near the Karnes County line. This wildcat, 1 Mrs. Hilda Mugge, takes the place of a location staked earlier as 1 Runge by Highland Oil Co.

Brewster-Bartle Drilling Co., Houston, Tex., is drilling B-2 Wilberts Mineral Corp. for Navarro Oil Co. near Grosse Tete, in Iberville Parish, Louisiana. It is below 9,000 ft. at 1 B. E. Quinn for Ohio Oil Co., 4½ miles northeast of Cleveland, in Liberty County, Texas. Last week it completed 1 J. C. Brewer for Ohio at 10,007 ft., in San Jacinto County, 6½ miles southwest of Shepherd. Brewster-Bartle has started work on 1 Fuller-Nelson, a wildcat test near Chalmers, Matagorda County, for its own account.

Turner Drilling Co. has contract to drill Cities Service Oil Co. 1 Cornelius De Young and G. Apps, C S½ SW NE 26-22n-6w, Missaukee County, Michigan.

Parker Drilling Co., Tulsa, and Houston, Tex., moved heavy rig into the Keystone area of Winkler County, Texas, for two wells in recently discovered pools from the Ellenburger lime below 9,000 ft. Parker has three leases in the area.

Oil Production Maintenance, Inc., Houston, Tex., has started work on two workover jobs. One is Humble Oil & Refining Co. 12 Broussard Trust, in the Lovell Lake field, Jefferson County, Texas, and the other is Coast Petroleum Co. 8 Maco Stewart,

M. A. Breckinridge, W. M. Dunn and Clyde S. Miller, operators on 1 Pete Warren, 8 miles northeast of Blackwell, Okla., 30-28n-1e, in the southwest part of Dilworth pool, confer with S. L. Tennant, owner of Comanche Drilling Co., contractor on the well

in the Dickinson field, Galveston County. This contractor recently finished working over 14 Stewart fee, in the Hitchcock field, Galveston County, for Stewart Oil Producers.

Robert W. Atha, drilling contractor, has been elected a member of the Gas Advisory Board of Michigan, to fill the vacancy caused by the resignation of W. A. Thomas.

Jack W. Frazier, Houston, Tex., has the contract for a wildcat to be drilled in Chambers County, Texas, in the Fig Ridge area, 5 miles northwest of Stowell, for Cox & Hamon. It is the 1 W. C. Tyrrell.

Muskegon Development Co., cable-tool contractor on Leslie T. Barber 1 Cairl, 30-13n-6w, Isabella County, Michigan, was scheduled to spud late last week.

Wynn Crosby Drilling Co., Houston, Tex., has contracted to drill 1 Acon, in the Anahuac field, Chambers County, Texas, for British-American Oil Producing Co. In conjunction with Kirby Petroleum Co. and John Mayo, this contractor has staked location for 1 J. E. Jackson, a 9,500-ft. wildcat test 10 miles south of Anahuac, on acreage farmed out by Gulf Oil Corp. Crosby will drill for its own account 1 Terry Jones, in the Clodine field, Fort Bend County. The company has completed its 1 M. Garcia, a wildcat 7 miles northwest of San Diego, Duval County, as a dry hole. This was a Sun Oil Co. farmout.

S. C. Herring, Abilene, Tex., is opening a new pool at Fain & McGaha et al 1 Patterson, Section 20, Block 17, T.&P.R.R. Survey, southern Jones County, Texas, 2 miles north of the Wimberly pool, from Tannehill sand topped at 2,195 ft. The well is estimated at 50 bbl.

Osage Drilling Co., Midland, Tex., composed of V. B. Likins and G. E. Hall, have sold to General American Oil Co. of Dallas 57 oil wells in Seminole, Wasson, and Emma pools of Gaines, Yoakum and Andrews counties, for consideration of $1,250,000 cash and $2,000,000 oil, Osage to receive a third working interest in the properties after amortization.

Appalachian Drillers Elect Directors

More than 50 contractors attended the annual meeting April 29 at Bradford, Pa., of the Appalachian Drilling Contractors Association. Twenty-seven members were elected to the board of directors, including Carl Groll, J. F. Flanigan, Milton Titus, George Kroh, I. H. Sporer, William Bentley, Lewis Cotton, of Bradford, Pa.; Fred Maitland, Derrick City, Pa.; Albert Cleveland, Smethport, Pa.

Norman Grosch, Clarendon, Pa.; H. J. Perry, Sheffield, Pa.; Milford Loop, Wesley Vaughn, Harold Curtis, Eldred, Pa.; Maurice McKenzie, Neil Harris, Rixford, Pa.; Forrest Atkinson, Paul Kahle, Jack Williams, Duke Center, Pa.; L. R. Oakes, Eugene Orcutt, Mount Jewett, Pa.; George Thompson, Cyclone, Pa.; C. L. Neiley, Myron Buhl, Kane, Pa.; O. S. Blackman, Allentown, N. Y.; Lee Harder, Wellsville, N. Y., and R. E. Gordon, Olean, N. Y.

G. G. Bauer, executive secretary of the organization, gave a report of the past year's activities. In addition to supporting the fight for retaining the depletion allowance, he said, one of the most outstanding accomplishments of the group was the outlining of necessary equipment needs to the director of materials for PAW District 1. He pointed out that the presentation of the supply problem to the material directors has enabled contractors to obtain needed equipment with a minimum of effort.

Frank Phillipbar, of Kendall Refining Co., addressed the meeting, telling how the Pennsylvania Grade refiners are aiding in supplying the armed forces with the peculiar types of oil, greases and aviation gasoline.

L. R. Oakes, of Mount Jewett, Pa., president of the association, presided at the meeting.

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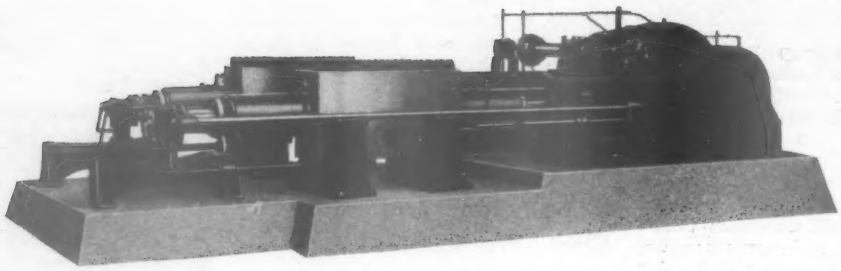

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PERSONALS

E. G. ROBINSON

Special Assignment By Shell Rewards Long Services

E. G. ROBINSON, manager of the eastern production area for Shell Oil Co., Inc., has been transferred to Houston where he will handle a special assignment under A. J. Galloway, resident vice president in charge of exploration and production. Mr. Robinson's transfer from Centralia, Ill., to Houston was involved in the merging of the eastern production operations as a division of the Mid-Continent area, a move that was necessitated by the heavy demands of the armed forces on the Shell production staff.

Mr. Robinson is a graduate of Cornell University where he received B.S. and M.S. degrees in geology. He started to work with Shell in 1925 and will complete his eighteenth year of company service this month. His first job with Shell was that of a geologist at San Antonio, Tex. He served in the same capacity subsequently at Dallas, Tex., and St. Louis, Mo. In 1930 he was made assistant to the vice president in charge of production at St. Louis, then the company's head office. He held that post for 6 years and in October 1937 was made manager of the eastern production area.

In announcing Mr. Robinson's transfer Mr. Galloway cited his work as a major contributing factor to the success which Shell experienced in its Illinois operations.

D. B. Haltom, who for years filled responsible posts in Humble Oil & Refining Co. and Standard Oil Co. of New Jersey and who maintained offices in both Houston, Tex., and New York, will make Houston his permanent business headquarters hereafter. During the time the late William S. Farish served as president of Humble and of Standard Oil, Mr. Haltom was his confidential assistant. Mr. Haltom's time will be devoted to matters connected with Mr. Farish's estate.

F. Julius Fohs, president of Fohs Oil Co., Houston, Tex., is in New York on a business trip. He plans to stop over in St. Louis, Mo., on his return to attend the midyear meeting of the Independent Petroleum Association of America.

Guy I. Warren, Corpus Christi, Tex., vice president of Renwar Oil Co., has been named chairman of a chamber of commerce committee to investigate the city's underground water supply. Mr. Warren has volunteered the services of Renwar geologists to study formations within Nueces County, Texas. Corpus Christi is reported to be facing a prospective water shortage.

Robert R. Kelly, Jr., Houston, Tex., who recently was advanced from technical sergeant to lieutenant somewhere in England, is a member of Producers Transport & Marketing Co. and Shelby County Crude Oil Co., both of which are headed by his father. Lieutenant Kelly majored in petroleum engineering at the University of Texas and was employed for a time in the engineering department of Humble Oil & Refining Co.

Maj. J. E. Barbee, formerly an engineer in the service of Humble Pipe Line Co., Houston, Tex., was recently advanced to his present military rank and made a post signal officer at Fort Sam Houston, Texas.

Paul Weaver, chief geophysicist of Gulf Oil Corp., Houston, Tex., and vice president of the American Association of Petroleum Geologists, was the speaker at a meeting of the Houston Rotary Club. Mr. Weaver, who returned recently from Russia, discussed "Eastern Russia and Siberia."

Frank Leach, division exploitation engineer, Shell Oil Co., Inc., Wichita Falls, Tex., resigned, effective May 5, to become associated with the Hollow Drilling Co. of Wichita, Kans. The date of his resignation coincides with his twentieth anniversary as an employe of Shell. **W. H. (Bill) Burke,** previously division production engineer at Wichita Falls, will be promoted to succeed Mr. Leach.

Gen. Alva J. Niles, retired Army officer, has arrived in Laredo, Tex., from Tulsa, and will reenter oil development work in that area, where he formerly was associated in oil operations with the late A. L. Edgington.

Guy S. Connors, vice president and general superintendent, Williams Brothers Corp., pipe-line contractors, has recovered sufficiently from a recent operation to be moved from the Good Samaritan Hospital to the Netherlands-Plaza Hotel, Cincinnati, Ohio, where he will remain for several weeks to recuperate.

Warren D. Skelton, Wyoming state mineral inspector, has returned from Washington where he conferred with Petroleum Administrator Ickes in connection with the move for higher crude prices. **A. B. Cobb,** of Montana, also attended the conference.

Maj. Paul G. Benedum, recently commissioned and assigned to the aviation-fuels branch of the Army Air Corps, since 1936, has been in charge of the Houston, Tex., offices of Benedum - Trees Oil Co., M. L. Benedum, Plymouth Oil Co., Hiawatha Oil Co., and Bentex Oil Corp. He is president of Bentex. Major Benedum is a graduate of Ohio State University, where he majored in geology. He at once entered the service of M. L. Benedum, of Pittsburgh, Pa., and continued with the Benedum interests without interruption.

Everett A. Jenkins, traveling superintendent of drilling and production operations of Skelly Oil Co., has been assigned exclusively to work in PAW District 3, including Texas, Louisiana, Arkansas, Mississippi and New Mexico. **George Berlin,** formerly Panhandle superintendent and now attached to the Tulsa office, will be traveling superintendent for Dis-

trict 2, covering operations in Oklahoma, Kansas, Nebraska, Illinois, Indiana and Michigan. **Dallas Brewster**, formerly district foreman for Skelly at Skellytown, Tex., succeeds Mr. Berlin as Panhandle superintendent. **M. N. Osborn**, district foreman at Wheeler, Tex., succeeds Mr. Brewster at Skellytown, and **W. W. Hughes**, warehouseman at Skellytown, becomes district foreman at Wheeler.

Gerald S. Frary, a Cut Bank producer, was elected president of the Montana Oil and Gas Producers Association at its annual meeting at Shelby last month. Other officers elected are: **L. R. Hanna**, Shelby, first vice president; **E. J. Hupp**, Cut Bank, second vice president; **La Rue Smith**, Great Falls, secretary and treasurer; and **James W. Johnson**, Shelby, chairman of the board.

J. C. Johnston, manager of the drilling and producing division of the Continental Oil Co. for the Rocky Mountain area, has returned to Denver headquarters from northwest New Mexico, where he went to inspect certain government projects his company is supervising.

K. S. Adams, president of Phillips Petroleum Co., Bartlesville, Okla., last week accepted appointment as chairman of the Oklahoma Postwar Planning Commission and as vice chairman of the state Planning and Resources Board.

E. W. Potter has been elected president and general manager of Mid-West Refineries, Inc., Grand Rapids, Mich. Mr. Potter joined Mid-West in March, 1940, as executive vice president. He had formerly been connected with Universal Oil Products Co., Chicago, and Cosden Petroleum Corp., Big Spring, Tex. **V. M. Skinner** was elected vice president.

E. R. Elledge, formerly Kansas district geologist for Phillips Petroleum Co., and **Frank Herring**, formerly Kansas production superintendent and petroleum engineer for Republic Natural Gas Co., have organized the consulting firm of Elledge & Herring and have opened offices in Wichita, Kans.

Bert Brush, scout for Carter Oil Co., Michigan district, has been transferred to Cut Bank, Mont. He was moved to Michigan about a year ago by Carter. **Floyd Galloway** has been transferred to Mount Pleasant, Mich., by the company from St. Elmo, Ill., to handle the scouting assignment.

Allen A. Jergins, formerly vice president of the San Joaquin Valley Oil Producers Association, vice president and director of the Jergins Oil Co., president of the Monterey Exploration Co. and vice president and director of the Lomita Gasoline Co., has been appointed director of the Facility Security Division of the Petroleum Administration for War. He succeeds **William D. Mason** who has returned to his post as superintendent of the Marcus Hook, Pa., refinery for Sun Oil Co., after serving the government agency on a leave of absence.

R. M. French, production engineer in the Los Angeles division for Continental Oil Co., has been advanced to assistant manager of the company's drilling and production department. Mr. French has done considerable research and experimental work with equipment used in the drilling of deep California wells by Continental Oil Co.

Howard R. Cuyler for the past year president of Standard Stations, Inc., has been appointed general sales manager of the Standard Oil Co. of California.

C. P. Watson of Seaboard Oil Corp. has been elected president of California Oil Producers Agency for the ensuing year. Mr. Watson stepped in temporarily a month or so ago to serve out the unexpired term of **Lawrence Vander Leck** who resigned to take over duties as director of production, PAW District 5.

W. H. McEachern has been appointed purchasing agent for War Emergency Pipelines, Inc., with headquarters in Cincinnati, Ohio, and has assumed his new duties. **H. M. Lingle**, whom Mr. McEachern succeeds, has returned to his former duties with the purchasing department of Humble Pipe Line Co., Houston, Tex.

W. W. Hearn is serving as assistant division superintendent of Section 26 of War Emergency Pipelines, Inc. Mr. Hearn was associated with Prairie Pipe Line Co., Tulsa, from 1914 to 1932, excepting for the years 1917 to 1919, when he served in the U. S. Army. In 1932 he became superintendent of the main line and of steel storage for Iraq Petroleum Co., Haifa, Palestine, where he served until early this year.

W. C. McMILLAN

W. C. McMillan has been named manager of Continental Oil Co.'s production and drilling department east of the Rocky Mountains, succeeding **J. G. Dyer**, whose resignation was announced in the Journal last week. **W. L. Kygar** and **R. W. French** have been named assistant managers of the department. Mr. Kygar was formerly assistant to Mr. Dyer, while Mr. French has been production engineer for the company's California division, with headquarters in Los Angeles. **W. E. Haggard** has been named to succeed Mr. McMillan as manager of the northern region of the land department. He has been manager of the land department of the southern region, with headquarters at Houston. **A. K. Tyson**, formerly division geologist at Houston, succeeds Mr. Haggard. The company also announces that the oil pipe-line terminal division, the telephone and telegraph division, and the oil-trading division, have been designated as the pipe-line department, with **A. C. Wilkinson** as manager, and **D. W. Sims**, formerly superintendent of the telephone and telegraph division, as assistant manager. **T. A. Van Griethuysen**, formerly superintendent of the oil-trading division, has been named assistant manager in charge of oil trading.

W. K. WHITEFORD

A. L. Ellsworth has been elected chairman of the board of the British-American Oil Co. of Toronto, Ont. He is succeeded as president of the company by **W. K. Whiteford**, previously executive vice president of the company and president of its American subsidiaries, the British-American Oil Producing Co., and the Toronto Pipe Line Co.

E. C. Moriarty, who was associated with Derby Oil Co. from 1918 to 1939, when he entered business for himself, and more recently connected with **A. L. Derby** and **A. S. Ritchie**, operating as D. R. M. Co., was recently re-elected to the city commission and at the last meeting of the commission was named mayor of Wichita, Kans.

Shifts: **G. C. Roberts**, geologist, Amerada Petroleum Corp., Midland to Corpus Christi, Tex.; E. W. Drake, engineer, Sun Oil Co., Thebodoux, La., to Beaumont, Tex.; **A. O. Crownover**, engineer, Shell Oil Co., Inc., Independence, Mo., to Richmond, Va.; **H. E. Stommel**, manager, Magnolia Petroleum Co., Edna, Tex., to Artesia, N. M.; **Charles A. Lutz**, engineer, Stanolind Oil & Gas Co., Fort Worth to Nixon, Tex.; **W. O. Keller**, manager, Stanolind Oil & Gas Co., Wink to Odessa, Tex.; **H. V. Tygrett**, geologist, Atlantic Refining Co., Lake Charles, La., to Tulsa; **Robert E. Collins**, manager, Texas Co., Sunburst, Mont., to Port Arthur, Tex.; **J. E. Backman**, geologist, Gulf Research & Development Co., Kingman, Kans., to Gillette, Wyo.

Edward C. Hall, chief clerk for the Humble Oil & Refining Co. in the Conroe district, Montgomery County, Texas, has been transferred to the

Anahuac district, Chambers County, taking the place of **Homer C. Snider**, who is now chief clerk in the Maurbro district, Jackson County. **Earl W. Daniel**, chief clerk in the Magnet district, Wharton County, has been moved to Conroe to succeed Mr. Hall. **Ben J. Gromer**, formerly in the Thompson district, Fort Bend County, has been transferred to Magnet as district chief clerk, to succeed Mr. Daniel.

D. A. Little, Dallas, Tex., president of Magnolia Petroleum Co., and **F. M. Frasher**, San Antonio, Tex., president of Duval Oil Corp., have been named as the two oil-industry leaders to receive special honor at the oil men's meeting and banquet to be held June 2 at the Gunter Hotel, San Antonio, under sponsorship of the South Texas Chamber of Commerce. The practice of paying honor to designated men at these annual gatherings was instituted in 1938. The honored men last year were **Harry C. Wiess**, Houston, president of Humble Oil & Refining Co., and W. M. Griffith, Sinton, Tex., vice president and general manager of Plymouth Oil Co.

Orville O. Kerr, secretary and treasurer of Deep Rock Oil Corp., Tulsa, has been named a director of the concern, succeeding the late William R. Francisco, executive vice president, who died January 11. **Alex W. McCoy**, manager of the land and exploration department, has been elevated to the office of vice president in charge of land and exploration.

Paul Endacott has been elected vice president and assistant to the president of Phillips Petroleum Co., Bartlesville, Okla., and **W. G. Hiatt** has been named vice president of the refining division. **Hy Bird** has resigned as vice president and assistant secretary to become vice president and treasurer of Panhandle Eastern Pipe Line Co. **T. S. Gay** was named assistant secretary and manager of the New York office of the company.

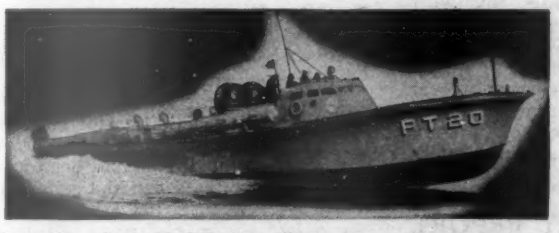
J. L. Sueeper, Jr., scout for the Texas Co., at Midland, Tex., has been inducted into the Army at Fort Bliss. He is the sixth member of the land department of Texas Co. at Midland to enter the armed services.

Ray L. Freeborn has been transferred to Midland from Houston by the Texas Railroad Commission to be district engineer for the West Texas area. Mr. Freeborn is a graduate in petroleum engineering from Texas A. & M. College.

Basil H. Minnich, chemical engineer, has been appointed to the research staff of Battelle Memorial Institute, Columbus, Ohio, and assigned to the division of chemical research. Mr. Minnich was an engineer for the U. S. Geological Survey prior to his recent appointment, and he has held positions with Standard Oil Co. of Ohio and Ashland Oil & Refining Co.

R. B. Roaper, chief safety engineer for Humble Oil & Refining Co., Houston, Tex., was elected president of the Texas Safety Association, which held its annual convention in Houston last week. Following service in the first World War Mr. Roaper went to work in the oil fields. He joined Humble in 1924 as safety engineer for refining, production, sales and pipe-line operations. He is a charter member of the Texas Safety Association and active in the National Safety Council.

Forest M. Towl has been elected chairman of the board of the Southern Group of Pipe Lines, Oil City, Pa. **Allen T. Towl** was elected president, **T. C. Towl** vice president and general manager, **J. M. Tussey** vice president and treasurer and **E. W. Ziegler** secretary.



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The ingenuity of our development and production engineers, in meeting the most rigid Government clutch specifications, can help you build more efficient power transmission control into your post-war models. Successfully equipping war machines with numerous types and sizes of clutches gave ROCKFORD engineers experience that will be valuable to you when designing new products. Our engineers will be glad to give you the benefit of their recommendations, based upon specifications.

Send For These Handy Bulletins on Power Transmission Control
Give capacities, dimensions and specifications. Contain application diagrams. Show HOW exclusive features of ROCKFORD CLUTCHES and POWER-TAKE OFFS are utilized to give you competitive market advantages.

ROCKFORD CLUTCHES have a wide range of applications.
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OIL WELL IMPROVEMENTS CO.
Pioneer creator and manufacturer of drilling and producing equipment, has been in the

FIRST LINE
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PRODUCTION FRONT

Now... OWI products are serving in the

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of the Navy's
DESTRUCTION FRONT

Orbit Geared Master Valve

And while most of our production facilities are devoted to vital production for our fighting Navy, we will continue to furnish Orbit Valves to the Oil Industry to the limit of our ability.

If you have any questions regarding the care and maintenance of your Orbit Valves, write us.

OIL WELL IMPROVEMENTS CO.
TULSA, OKLAHOMA

Market Developments

East Coast

NEW YORK.—The critical shortage of gasoline which has been apparent in the East Coast area for the past few weeks was moderated somewhat last week with more complete relief being expected in the near future. The relief developed as a result of the increase in receipts of gasoline via tank cars switched from heating-oil service. These receipts were rising to appreciable volume last week for the first time. Meanwhile, there was a reduction in heating-oil deliveries so that while the gasoline situation was improved the over-all picture was only slightly changed.

There was also evidence that rationing officials anticipated a somewhat easier supply situation next winter. This was apparent in the disclosure of fuel-oil ration plans for the winter of 1943-44. The basic plans are similar to those in effect last season but the amounts are increased and are expected to result in 15 to 20 per cent more oil being made available to consumers.

Black market conditions continue to play a large part in the eastern area and numerous prosecutions have been undertaken by the OPA.

The gasoline situation in western Pennsylvania, where excess stocks were reported in recent weeks, has changed considerably according to figures presented by the PAW in denying increased ration quotas for that area. These figures showed that a steady and substantial drain on stocks has occurred and indicated that there would be no easing of restrictions.

Mid-Continent

ABOLITION of tank-car shipment of heating oil from the Middle East to East Coast (District 1) points introduced another complication this week in Mid-Continent refinery markets. The PAW telegraphed about 45 suppliers in the Mid-Continent and Middle West refinery districts to discontinue tank-car shipments of heating oils, except traffic originating at Ohio and Mississippi River terminals received by barge from the Southwest.

Refiners were not immediately disturbed by the latest transportation directive. In fact, they welcomed the opportunity to replenish stocks which have been liquidated in the Middle West to an inordinately low figure through the winter and spring months. Complacency, however, did not extend beyond a nearby period because Mid-Continent refiners are currently producing larger percentages of fuel oil than at any similar time in recent months, meaning that existing storage facilities may be inadequate to cope indefinitely with both restrictive regulations.

Markets in general held their steady position this week. There were no particular features, except the stronger tone of the natural-gasoline market. Refiners, manufacturing smaller percentages of gasoline from crude and in some instances operating on reduced throughput schedules, are blending larger volumes of stabilized natural. The drain on stabilized grades of natural is tending to strengthen the entire market.

Gulf Coast

HOUSTON, Tex.—With vigorous demand reported for all oil products, lack of adequate transportation facilities was all that prevented an extremely lively market this week. Strength of gasoline was increasingly pronounced. Some Gulf Coast marketers were passing up orders because of their uncertainty concerning carriers. Appeals from Atlantic seaboard points are significant of pressing needs. Predictions that the Government's ban on tank-car shipments of gasoline into District 1 will be lifted soon are heard, but no substantial ground for such prophecies is mentioned. In view of continued lively demand for tank cars to move heating and burner oils to northern and eastern areas, in order to build up stocks against next winter's requirements, most observers express belief that early removal of the tank-car ruling is wholly unlikely.

It had been assumed that with the arrival of warmer weather some of the tank cars which had been carrying heating and burner oils to the North would become available for moving gasoline—if not to District 1, then to other destinations. Few signs of such reallocation of cars are visible except to the extent that they are being employed in moving various oil products required by the Army and Navy. Diesel oil, lubricants, and several grades of motor fuel are materials especially needed by the armed forces. The call for diesel oil increased in urgency during the week.

Rising demand for aviation fuels and for 80-octane all-purpose gasoline was reported this week. Independent refiners whose plants are not equipped to manufacture high-octane grades were managing to keep their inventories in fairly satisfactory shape through distribution by truck to short-haul buyers. Kerosene was exceedingly scarce.

Pacific Coast

LOS ANGELES, Calif.—California markets continued dull and inactive, a characteristic that has marked trading activities for several weeks. Fuel oil in the spot market has not been moving as had been anticipated as buyers are not offering top prices.

Liftings by the military services have been below expectations. Marketers are not especially desirous of buying fuel oil and then storing it until such time as the armed services call for loading. This is but a temporary condition, however, and before long liftings will be increased. It is the wish of Navy Department that stocks of fuel oil be increased in order to guarantee a sufficient supply when needed on the Pacific Coast.

Gasoline sales in California have shown considerable variation during the past few months with the result that it is still too early to estimate normal consumption.

Fuel oil in the spot market is moving in limited quantities at 90 cents to $1 but firm offers at these prices have been turned down by those holding stocks. Gas oil, however, commands top prices but very little is moving. Gasoline is slightly firmer as a highly competitive condition in the retail market has been eased by increased tank-wagon prices on the part of three independent marketers.

A.P.I. REFINERY REPORT

Week Ended April 24, 1943

(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks—Gasoline	Stocks—Residual	Stocks—Gas oil
Appalachian	159	2,576	452	799
Ind., Ill., Ky.	709	19,326	2,565	3,433
Okla., Kan., Mo.	350	7,044	1,395	1,616
Censored area*	1,667	38,932	10,235	13,879
Rockies	99	2,089	510	347
California	753	21,147	52,298	11,068
Total 4-24-43	3,737	91,114	67,455	31,142
Total 4-17-43	3,672	92,121	67,007	30,926
Total 4-25-42	3,500	103,359	80,374	28,407

*Reports combined on East Coast, Texas Gulf, Louisiana-Arkansas and Inland Texas at request of PAW.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)*

Week ended:	Bbl. of crude*
April 24, 1943	242,035,000
April 17, 1943	241,421,000
April 25, 1942	257,073,000

*Excludes unrefinable California stocks.

Refinery Prices

(Prices as of May 4)

Quotations are f.o.b. plant in cars and in cents per gallon except where otherwise noted. They are exclusive of the federal excise taxes of 1.5 cents a gallon on gasoline and 4.5 cents a gallon on lubricating oils, and do not include marine lighterage charges.

REFINERY GASOLINE

Octane (A.S.T.M.):	†80	74-76	72-74	68-70	63-66
Mid-Continent*			5.875-6.000		5.500-5.625
Pennsylvania		6.750-7.000			
Gulf Coast‡	6.00-6.50		§5.750-6.250	§5.750-6.250	§5.250-5.750
Northeast Coast	9.80		9.2	9.2	
California		6.125-6.500	6.000-6.125	5.500-6.000	5.000-5.250

*Basis Group 3. †1939 C.F.R. (research method). ‡Integrated companies restricted to lowest prices. §Unleaded.

KEROSENE AND NO. 1 FUEL OIL

Gravity:	46	45	42-44	41-43	38-40
Mid-Continent*			4.500	4.375	
North Louisiana				4.500-4.750	
Pennsylvania	6.250-6.625	6.125-6.250			
California				4.500-5.500	4.250
Northeast Coast				6.80	
Gulf Coast				4.125	

*Basis Oklahoma Group 3.

TRACTOR, DIESEL, AND BUNKER FUEL OIL

Specifications:	48-48° G.	24 D.I.	48-52 D.I.	58 & above	Diesel bunkers	Residual Bunker C§
Mid-Continent*	4.125					$0.80-1.27
California		2.750-4.000			‡1.45-1.50	0.95-1.00
Gulf Coast			4.000	4.125	1.45	0.85-1.27
Northeast Coast				6.800	2.780	1.65-2.07
North Louisiana						0.80-1.27

*Basis Oklahoma Group 3. †10-14° gravity. ‡Pacific Specification 200. §Gravity range.

FURNACE OIL, GAS OIL, FUEL OIL

	No. 2	No. 3	No. 5	No. 6
Mid-Continent*	3.625-3.750	3.500-3.625	$0.85	$0.80
Pennsylvania (West)	5.875-6.125	5.875-6.000	†5.250-5.500	
Northeast Coast	6.7	6.7	1.95	1.65
California	5.5	5.5	‡1.10-1.25	§1.10-1.15
Gulf Coast	3.875-4.0		1.65	0.85

*Basis Oklahoma Group 3. †36-40 gravity fuel. ‡Pacific Specification 300. §Pacific Specification 400.

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	3.875	4.650
North Texas	3.500	4.200
North Louisiana	3.625	4.350
California	4.875	5.500

LUBRICATING OILS

Bright and Steam Refined

OKLAHOMA (Group 3)—		
200-210 D, 10-25		27.00
150-160 D, 0-10		23.00
120-125 D, 0-10		22.00
Steam refined:		
600 dark green (untreated)	9.00	9.50
PENNSYLVANIA—		
Bright Stocks (Pennsylvania Grade No. 8 color, 140-150 at 210, 545-550 flash)		
10 pour point		30.50
15 pour point		29.50
25 pour point	25.00	28.00
Steam refined:		
600	15.00	16.00
650	15.50	16.50
600 flash	16.00	17.50
650 flash	17.00	17.50

Neutral Oil
(Vis. at 100° F. except Pennsylvania and color N.G.A.)

OKLAHOMA (Group 3)—	
0-10 pour point:	
200-3	15.00
300-3	18.00
500-3	19.50
600-3	20.00

Note: Viscous neutrals, 10-25 pour, quoted 0.5 cent under 0-10 oils.

Neutral Oils

CALIFORNIA—		
Pale Oils:		
200-2½-3	7.00	7.75
400-3-4	7.25	8.00
600-3-4	8.75	11.00
Red oils:		
200-4-5	7.00	7.75
400-5-6	9.00	11.00
500-900, 5-6½	9.25	11.25
GULF COAST—		
Pale oils:		
200-3	8.50	8.75
300-3	9.00	9.25
500-3½	9.75	10.00
750-3½	10.00	10.25
2,000-4	10.50	11.00

PENNSYLVANIA—	
150 vis. at 70° F., 3 color, 400-405 flash:	
Zero pour point	37.50
10 pour point	36.50
15 pour point	35.50
25 pour point	30.00
200 vis. at 70° F., 3 color:	
Zero pour point	39.50
10 pour point	38.50
15 pour point	37.50
25 pour point	32.00

WAX

(Cents per pound)

OKLAHOMA (Group 3)—	
124-126 (A.m.p.) w.c. scale	4.250
PENNSYLVANIA (inland refineries)—	
122-124 (A.m.p.) w.c. scale	4.250
124-126 (A.m.p.) w.c. scale	4.250
NEW YORK—	
Wax in bags fully refined:	
130-132 (A.m.p.) wax	5.650
133-135 (A.m.p.) wax	6.150
Crude scale:	
124-126 (A.m.p.) w.s.	4.250
124-126 (A.m.p.) y.s.	4.250

TANK-WAGON PRICES IN 50 CITIES

(Gasoline prices based on regular grades, tax included, undivided dealer)

ATLANTIC AND NEW ENGLAND
(Socony-Vacuum Oil Co., Inc., and Atlantic Refining Co.)

	Dealer tank wagon	Combined tax	Kero tank wag
Baltimore, Md.	15.95	5.50	10.20
Boston, Mass.	14.90	4.50	9.80
Burlington, Vt	16.90	5.50	10.10
Buffalo, N. Y.	16.20	5.50	10.60
Dover, Del	16.70	5.50	12.00
Hartford, Conn.	15.60	4.50	9.70
Manchester, N. H.	17.30	5.50	10.80
Newark, N. J.	15.20	4.50	9.70
New York, N. Y.	16.10	5.50	9.80
Philadelphia, Pa.	16.20	5.50	11.65
Pittsburgh, Pa.	16.70	5.50	12.00
Portland, Me.	16.30	5.50	9.90
Providence, R. I.	15.00	4.50	9.60
Washington, D. C.	15.20	4.50	11.00
Average 14 cities	16.02	5.14	10.49

(All prices undivided dealer basis.)

CENTRAL
(Standard Oil Co. of Indiana, Standard Oil Co. of Ohio, Continental Oil Co., and Texas Co)

	Dealer tank wagon	Combined tax	Kero tank wag
Chicago, Ill.	13.40	4.50	10.30
Cleveland, Ohio	15.00	5.50	*9.00
Dallas, Tex.	13.00	5.50	7.00
Des Moines, Iowa	14.40	4.50	9.80
Detroit, Mich	14.40	4.50	9.60
Fargo, N. D.	16.90	5.50	11.30
Huron, S. D.	16.30	5.50	10.70
Indianapolis, Ind	15.20	5.50	9.80
Little Rock, Ark.	17.50	8.00	10.00
Milwaukee, Wis.	16.10	5.50	10.50
Minneapolis, Minn.	15.40	5.50	10.30
Omaha, Neb.	15.40	6.50	9.80
Tulsa, Okla.	16.50	7.00	8.50
Wichita, Kans.	13.70	4.50	8.00
Average 14 cities	15.15	5.57	9.81

*Includes 1-cent state tax.

SOUTHEASTERN
(Standard Oil Companies of New Jersey, Kentucky, and Louisiana)

	Dealer tank wagon	Combined tax	Kero tank wag
Atlanta, Ga.	18.90	7.50	*11.50
Birmingham, Ala.	18.50	8.50	9.00
Charleston, S. C.	18.95	7.50	
Charleston, W. Va.	19.25	6.50	13.30
Charlotte, N. C.	20.10	7.50	11.30
Jacksonville, Fla	18.90	8.50	9.50
Jackson, Miss.	17.50	7.50	†9.00
Louisville, Ky.	16.50	6.50	8.50
Memphis, Tenn.	17.90	8.50	10.50
New Orleans, La.	17.75	8.50	*10.00
Norfolk, Va.	17.45	6.50	12.00
Average 11 cities	18.34	7.50	10.48

*Includes 1-cent state tax.
†Includes ½-cent state tax.

MIDWESTERN
(Continental Oil Co.)

	Dealer tank wagon	Combined tax	Kero tank wag
Albuquerque, N. M.	17.50	7.50	10.00
Boise, Idaho	20.10	6.50	16.50
Casper, Wyo.	17.00	5.50	12.00
Denver, Colo.	14.50	5.50	11.00
Helena, Mont.	17.00	6.50	13.00
Phoenix, Ariz.	18.50	6.50	12.50
Reno, Nev.	17.50	5.50	13.50
Salt Lake, Utah	18.50	6.50	14.50
Average 8 cities	17.58	6.25	12.88

PACIFIC COAST
(Standard Oil Co. of California)

	Dealer tank wagon	Combined tax	Kero tank wag
Portland, Ore.	17.00	6.50	13.50
San Francisco, Calif.	14.50	4.50	11.50
Seattle, Wash.	17.00	6.50	13.50
Average 3 cities	16.17	5.83	12.83
Average 50 cities	16.55	5.96	10.76

Equipment Progress

Vertical-Hollow-Shaft Explosionproof Motors

A new line of vertical-hollow-shaft explosionproof motors is now offered by Fairbanks, Morse & Co., Chicago,

Ill., for operation in Underwriters' Class I Group D hazardous gas locations. These motors are designed primarily for pumps handling large quantities of volatile materials such as high-octane aviation gasoline.

Special equipment is required for the efficient handling of gasoline in fueling planes at each of our numerous air fields, as well as for transferring gasoline from tankers to storage locations at our various outposts throughout the world. Numerous applications are arising requiring motors designed to prevent explosions and fires and Fairbanks-Morse horizontal and vertical explosionproof motors are recommended to minimize this hazard.

Green, Tweed Appoints Two Representatives

Greene, Tweed & Co., New York City, announces the appointment of J. J. McIntosh as southeastern sales representative, and B. F. Coombs as Texas sales representative.

Mr. McIntosh will have as territory the states of Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and also Tennessee east of Tennessee River. He has had many years of industrial-sales experience in this territory, and his headquarters are at 1106 McLynn Avenue, Atlanta, Ga.

Mr. Coombs is well known throughout the eastern Texas and western Louisiana oil industry, which he will cover for Greene, Tweed from headquarters at Houston.

Stirling Production Director Heat Exchanger Section

N. W. Stirling, head of the Heat Transfer Division of M. W. Kellogg Co., has been appointed, on a consulting basis, production director of the Heat Exchanger Section of WPB. Mr. Stirling was formerly president of the Tubular Exchanger Manufacturers Association.

Completes Training

Lt. Kenneth Craver, of Thornhill - Craver Co., Houston, Tex., manufacturers of Unibolt couplings, recently completed a course of training at the Naval Air Station at Quonset Point, R. I. After a short leave Lieutenant Craver will report for permanent assignment.

Meehanite Moves Office To New Rochelle, N. Y.

Meehanite Metal Corp. and Meehanite Research Institute of America, Inc., announce the moving of their headquarters from Pittsburgh, Pa., to Pershing Building, New Rochelle, N. Y. The new headquarters will feature enlarged laboratory and research facilities, and will permit the rendering of improved service to industrial users of Meehanite castings and the members of the Meehanite Research Institute.

"E" AWARD TO FOOTE BROS. GEAR & MACHINE CORP.

On Saturday, March 27, the Army and Navy honored the workers and management of Foote Bros. Gear & Machine Corp. with the Army-Navy "E" for excellence in production.

The precision-gear department of Foote Bros. is producing precision gears for Pratt & Whitney aircraft engines and the industrial-gear department, besides supplying gears and speed reducers for power transmission in industry, is also producing special gears and speed reducers for landing barges, ammunition, hoists, listening devices and other applications strictly for the Army and Navy.

H. Mansfield Horner, vice president of United Aircraft Corp., and general manager of Pratt & Whitney Engine Division, acted as master of ceremonies, and Rear Adm. Clark H. Woodward presented the Army-Navy "E" pennant to William A. Barr, president of Foote Bros. Col. William A. McCarty presented the "E" pin to Joseph D. Persily, president of United Electrical Radio & Machine Workers, Local 1114, and a group of employes representing the workers of Foote Bros.

Rear Adm. Clark H. Woodward, U.S.N.; Joseph D. Persily, president, United Electrical Radio and Machine Workers, Local 1114; Frances H. Klinck, Rose N. Oat and Henry E. Soderling, employes; William A. Barr, president, and Col. W. H. McCarty, U.S.N.

Classified Advertising

EQUIPMENT FOR SALE

FOR SALE: Rotary Drilling Rig—Wilson Giant Drawworks, LeRoi 8 Cylinder Gas-Butane Engines, never run since rebuilt, choice 7¼" x 14" or 7¾" x 18" Lucey Pump, 122' Moore Derrick, outfit complete.
LUCEY PRODUCTS CORPORATION
Tulsa, Okla.

1—Parkersburg SC11 pumping unit stroke 5' to 11' at a bargain price. JOS. GREENSPON'S SON PIPE CORP., National Stock Yards, St. Clair, Ill.

3" WATER LINE, 9000', price 24c. 2000' 4½" drill pipe, long joints, Hughes fullhole, price 75c. 3-25 HP single cylinder gas engines, with reversible clutches, price $175.00 each. A. W. Adkisson, W. T. Waggoner Bldg., Fort Worth, Texas.

200 HP FAIRBANKS-MORSE-175 KVA light plant—2300 volt—100 HP 75 KVA 2300 volt. OIL CASING blocks, RD7 Bulldozer, 50 Diesel-Caterpillar bulldozer-G6 Scraper. Steam high pressure pumps—1¼ yard Thew Lorine Shovel—5 Kohler 5KW light plants—77 Austin Western Tandem Patrol—1½ and 2 yard clamshell buckets—1¼ Page dragline—½ yard BUCKEYE DRAGLINE—Byers trench hoe—RD7 complete with side boom winch 60 ft. boom. Send us your inquiries, we can furnish your wants in machinery line. MACHINERY SALES COMPANY, 1718 Walnut, Kansas City, Mo., day VICTOR 2731; night WESTPORT 4070.

15 STORAGE TANKS, welded and riveted, clean. 6,000 to 12,000 gallon, or complete bulk plant for gasoline and lube oil. P.O. Box 284, Tulsa, Okla.

HORIZONTAL TANKS

3—14,250 Gal. Cap. 9' x 30'
2—11,250 Gal. Cap. 8' x 30'
1—10,500 Gal. Cap. 10' x 17'
Located Illinois and Michigan

R. C. STANHOPE, Inc.
60 E. 42nd St. New York, N. Y.

162—3½" OD—6½" Centers—Chrome Key Headers
30—Pieces 3½" ID—4" OD—21' to 28' Long—Chrome Tubes
120—Pieces 3" ID—3½" OD—30' Long—Chrome Tubes
1—½" Shell 5'x74'—4000 barrel cap. Crude Oil Fractionator with Trays
30—Pumps, various sizes and types

A. C. BARTSCH
BOX 127 FOREST PARK, ILL.

FOR SALE:

300—13" OD, 8 thread, new casing couplings

1—Gasoline Power Drilling Rig good for 3000'.

Also Steam Drilling Rigs and pipe and casing of all sizes.

We also purchase abandoned Leases, Refineries, pipe lines and other oil field equipment.

If in need of material or have material for sale, communicate with

Louisiana Iron & Supply Co.
Shreveport Louisiana
Phone 5223 or L.D. 1

EQUIPMENT FOR SALE

2 COMPLETE UNITS. 2—100 HP Long Base Continental twin cycle, oil Drilling Engine Comp. with OCS type FC reverse Clutch mounted on Long base, V belt (9-330E) American Air Filter, 1½" F&M—Fig. 55110 Centrifugal Pump. Aux. Starting Unit and Lighting Plant consisting of 5 HP. type B-F&M engine, 3 by 3½ type E F&M Compressor, 2½ KW F&M Generator, 1—20" by 60" Air tank all mounted on steel base. Price $2,500 Each Unit Complete. Harvey Creek, 3105 N. Broadway, Wichita, Kans.

FOR SALE: Complete 150 ton capacity absorption refrigerating machinery. Steam driven air compressor 650 C.F.M. Steam driven A.C. Generator 75 K.W., 220—3—60. Two Vogt water tube boilers 250 H.P. each, 125 lbs. Ice cans, Cranes, Steam pumps. CAPITAL ICE REFRIGERATING CO., INC., Indianapolis, Ind.

FOR SALE: 1500 ft. of 5⅝" drill pipe, used very little, price $1.50 per ft. Located Kermit, Texas. J. R. SHARP DRILLING CO., Philtower Bldg., Tulsa, Okla.

TWO line pumps, 7000 bbl. day each. One Centrifugal 1200 gpm. 60 ft. 1150 rpm. 2000 gpm. 150 ft. 1750 rpm. One Centrifugal 875 gpm. 320 ft. 1750 rpm. with 75 hp. 2200 volt motor. One 75 hp. 3 phase 60 cycle 2200 volt 1800 rpm. G.E. Vertical solid shaft motor. Large stock mechanical packings for all services including butane and propane. One 9" x 10" Vertical outside packed triplex pump rated 500 gpm. at 125 pound. One 7" x 6" Sullivan WG 6 Air Compressor. One 4" x 5" Goulds Pyramid packed piston pump. One 7½" x 4½" x 10" Worthington Simplex Boiler Feed Pump. Two 4" Crane 800# swing check valves with companion flanges. CORKEN PUMP COMPANY, Oklahoma City, Okla., LD 765.

EQUIPMENT WANTED

WANTED: PUMPS, CLOSE CLEARANCE, CAST IRON LIQUID END SIMPLEX

GPM	Suction	Discharge	Size
8	300	500	6½ x 3 x 8
11	300	550	6½ x 3 x 8
14	80	550	14 x 3 x 14
12	250	360	6½ x 3 x 8
28	300	360	6 x 5 x 12
28	300	360	6 x 5 x 12

Box B-601, The Oil and Gas Journal, Tulsa, Okla.

TANKS WANTED: 2—7500 bbl., 4—5000 bbl., 3—2500 bbl. All must be welded or riveted. Give dimensions, thickness sheets, approximate weight, price, location, earliest delivery and charge for dismantling. The W. H. Dyer Co., Fullerton Bldg., St. Louis, Mo.

WANTED—Morpholine or Nitro-paraffin in any quantities. We are in dire need of Morpholine or Nitro-paraffin in our plant. If you have surplus stock and would like to sell, write or wire Minnesota Mining & Manufacturing Co., St. Paul, Minn.

WANTED: Bucyrus Erie Drilling Machine, Type 24L - 24W 22W or 33W in good condition. Will pay cash. Write George Perry, Glencoe, New Mexico.

WANTED: Truck Load quantities of good used 5¼" O.D. (4⅞" I.D.) Casing, threaded and coupled. Also 5" I.D. Line pipe or casing. Advise price and location. CENTRAL PIPE & SUPPLY CO., P. O. Box 1442, Lubbock, Texas.

WANTED: Good used steel drums from 10 gallon to 55 gallon. Can use bad order drums same sizes. Advise price and condition. CENTRAL PIPE & SUPPLY CO., 2611 Ave. H, P.O. Box 1442, Lubbock, Texas.

WANTED

Used storage tanks:
Pressure Tanks:
All sizes
Send us your list.

SONKEN-GALAMBA CORP.
108 N. 2nd St., Kansas City, Kansas

EQUIPMENT WANTED

WANTED: VESSELS
1—24" x 32' x ⅛"-⅝" Shell
2—30" x 12'-15' x 15/16"-1" Shell
1—24" x 50' x ⅜"-½" Shell with Bubble Plates.
Box B-602, The Oil and Gas Journal, Tulsa, Okla.

WANTED

Used Structural Steel
Pipe — Valves
Fittings
Send us your list.

SONKEN-GALAMBA CORP.
108 N. 2nd St., Kansas City, Kansas

EQUIPMENT WANTED: Magnetometer for oil prospecting. State price and condition. Box B-581, The Oil and Gas Journal, Tulsa, Okla.

WANTED: Truck load quantities, or more, of used small pipe, black and galvanized, ½", ¾", 1", 1¼" and 1½", shopped or unshopped. Advise price and location. CENTRAL PIPE & SUPPLY CO., 2611 Avenue H, Lubbock, Texas.

WANTED: Good used malleable standard screw fittings from one-eighth to four-inch inclusive in all sizes and kinds, also standard screw iron and brass globe and gate valves same sizes. Advise price and condition. CENTRAL PIPE & SUPPLY CO., 2611 Ave. H, P.O. Box 1442, Lubbock, Texas.

WANTED

WANTED: National Oil Scouts & Landman's Ass'n. Year Books, Vols. 1 to 6 inclusive. Ward S. Merrick, Box 971, Ardmore, Okla.

COMPLETE Plants, Pipe-Lines, and Industrial Enterprises bought for cash or liquidated for the owners. Wire, phone, or write—INDUSTRIAL SUPPLY & EQUIPMENT CO., INC. 1044 Canal Bldg., New Orleans, La.—MA 5586.

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CAPITAL SEEKERS—Interested in raising $25,000 or more for a legitimate project should write to AMSTER LEONARD, Fox Theater Bldg., Detroit, Mich.

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Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Texas*
18-18.9	$0.80	....	....	....
19-19.9	.84	....	$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	....	1.07	1.30	.94
32-32.9	....	1.09	1.32	.96
33-33.9	....	1.11	1.34	.98
34-34.9	....	1.13	1.36	1.00
35-35.9	....	1.15	1.38	1.02
36-36.9	....	1.17	1.40	1.04
37-37.9	....	1.19	1.42	1.06
38-38.9	....	1.21	1.44	1.08
39-39.9	....	1.23	1.46	1.10
40 and above	....	1.25	1.48	1.12

*Includes Lea County, New Mexico.

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Journalisms:

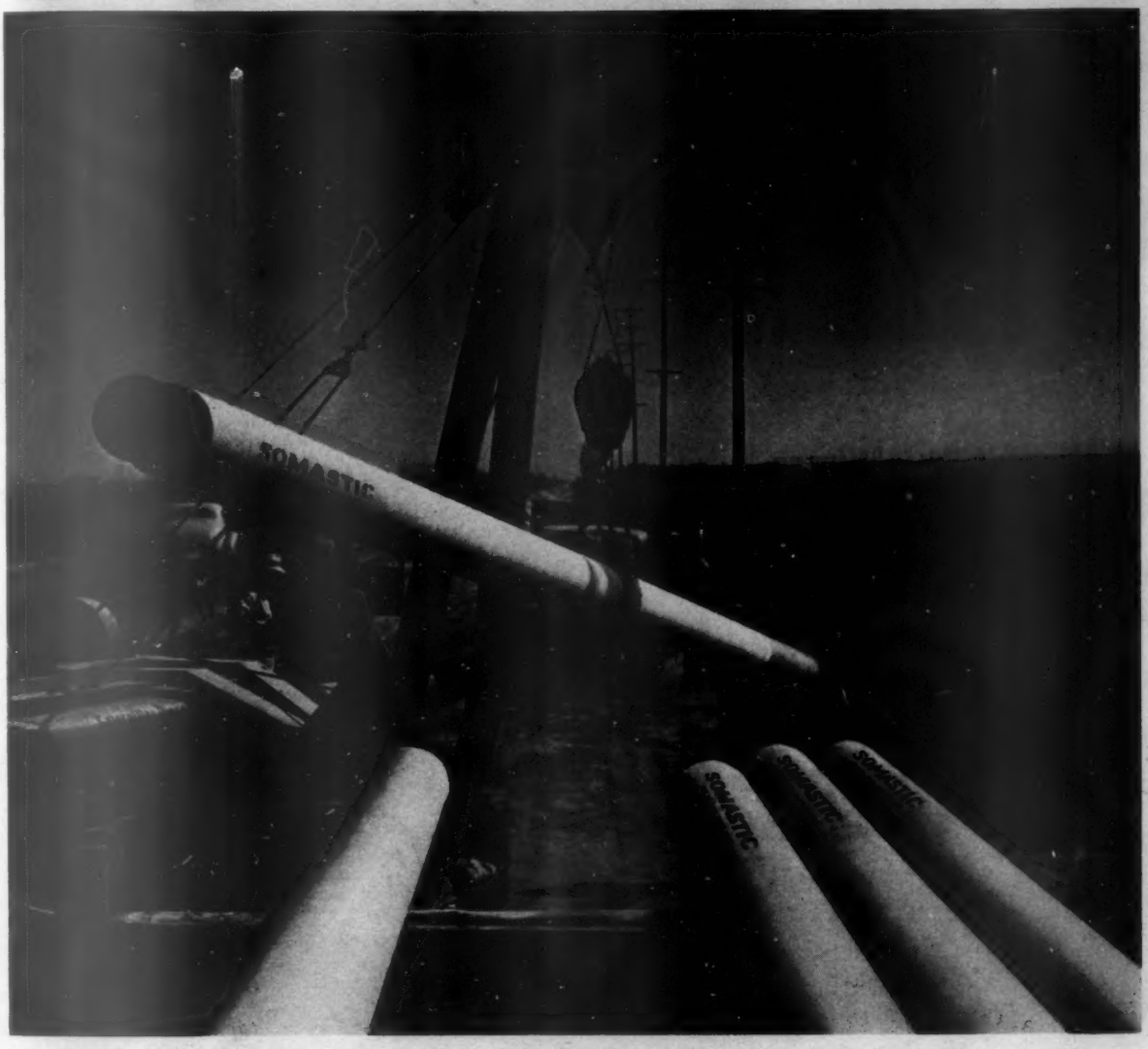
GETTING the Big-Inch line across the Mississippi River presented some engineering problems of which the solutions will probably serve as standard practice for trunk-line crossings of large rivers in the future. These will be discussed in a staff article in next week's Journal.

ONCE in a long while an article of outstanding importance appears which provides a basis for planning developments for years to come. Such a paper is The Development and Control of Oil Reservoirs, by S. E. Buckley and R. C. Craze, of Humble Oil & Refining Co. This paper, which summarizes conditions in reservoirs of the different types and discusses proper well spacing and production methods designed to secure maximum recovery, will be published in full in next week's Engineering and Operating Section.

FLOWERS bloom late this spring. Just now comes to hand a bouquet from the technical coordinator of the synthetic-rubber division of a large rubber company, Dr. C. W. Walton, Goodyear Tire & Rubber Co. Replying to an inquiry for information on synthetic rubber, Dr. Walton wrote: "We call to your attention the November 26, 1942, issue of The Oil and Gas Journal, which is published weekly by the Petroleum Publishing Co., 211 South Cheyenne, Tulsa. This contains the most comprehensive resume of all phases of the problem of synthetic rubber that we have yet seen released for public consumption. It includes articles on raw-materials supply, equipment, the actual polymerization reactions and their economics and the particular requirements for which the different types of synthetic rubber may be used." That just about says everything, except we gladly concur.

LOSS of oil from field tankage represents a major expense in many fields. One company has devised a portable test unit whose use has resulted in noteworthy savings. This unit will be fully described in a staff article next week.

SOMASTIC



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Pipe steel is conserved with safety **when SOMASTIC Pipe Coating is used. The thickness of new pipe can be reduced to the minimum required by line pressure; on existing lines the present pipe is preserved. Fourteen years on lines in corrosive areas... *without failure*... attests the permanence of SOMASTIC protection.**

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...back from danger

Safe on the carrier's deck, the Wildcat returns from a mission of danger! The giant Wasp engine in its nose has roared it to Victory—and brought it back, safe.

The engineering problems represented by these 18 powerful cylinders are staggering. Take the matter of reduction gears alone. Stepping down the high speed of the whirling crankshaft to the necessary slower propeller revolutions requires gears of such light weight and such extreme precision that only a slight variation would quickly spell their destruction. And yet, the flow of engines coming off production lines to power the world's mightiest air armada demands that these gears be produced by the hundreds of thousands.

And making these gears is Foote Bros.' job—a job that only a few months ago was considered well nigh impossible. How new production techniques—new engineering developments—resulted in the present production that keeps three plants of Foote Bros. Gear and Machine Corporation busy cannot be revealed until the war is won. But when "V" Day comes, these manufacturing know-hows can be applied to the making of precision gears for any product where close tolerances can aid in securing better performance and greater economy.

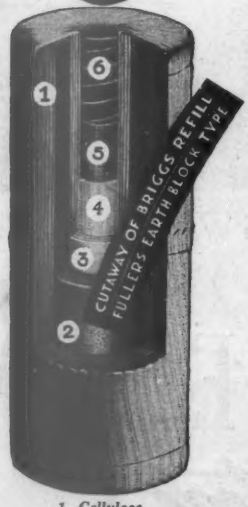
FOOTE BROS. GEAR AND MACHINE CORPORATION • 5225 S. Western Boulevard, Chicago, Illinois

The Grumman Wildcat pictured here has been the Navy's first line fighter since Pearl Harbor. O'Hare, Thatch, Gaylord and other Navy Aces became famous in the cockpit of this tough plane.

ARMY E NAVY

FOOTE BROS.

Better Power Transmission Through Better Gears



1. Cellulose
2. Fullers Earth Block
3. Cellulose 4. Knit Tubing
5. Center Tube 6. Spring

WHETHER OIL is maintained "refinery pure"—or merely cleaned of solid abrasives—depends on the filter's ability to go ***a step beyond*** removing carbon, dirt and grit. That ***extra step***—which spells the difference between maintaining oil chemically pure as well as physically clean—is the ADsorption of invisible impurities; the absolute removal of harmful acids, resins and gums from the oil.

Engineers at Briggs Clarifier Company—recognized specialists on oil clarification—licked the problem of cleaning oil by developing moulded blocks of Fullers Earth into a refill cartridge which would remove engine-corroding acids and sludge-forming resins and gums. ADsorption, coupled with the Clarifier's ability to ABsorb solid particles, keeps oil like new. This makes oil last longer—protects your engine—and reduces maintenance costs.

Briggs Clarifiers lend themselves to practically any type of installation . . . by-pass . . . connected directly in the high pressure oil line . . . with separate pump and motor . . . or off the engine's scavenging pump. They are compactly designed in a single unit and easily serviced.

Submit your lubrication problems to us today. Our research laboratories are in a position to provide complete and constructive solutions to your problems.

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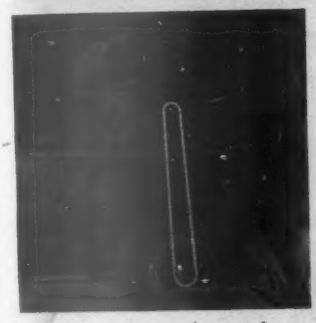
PIPE LINE CONSTRUCTION is one of the activities of the W. A. Bechtel Co. Illustration shows preparation for river crossing.

W.A.BECHTEL CO.

Constructors

SAN FRANCISCO

WIDE ACCEPTANCE *through* FINE PERFORMANCE



Oil well surveying truck

● Link-Belt Silverlink finished steel roller chain is the No. 1 choice of roller chains in so many oil industry applications today because of its unfailing performance assured by so many valuable features.

Drive from engine to mud pump

SILVERLINK users enjoy the advantages of these and many other outstanding Link-Belt chain qualities:

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- High standard of precision
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- Great strength—lightweight
- Ability to withstand shock
- Flexibility of operation
- Complete range of sizes
- Helpful engineering service
- 67 years' experience

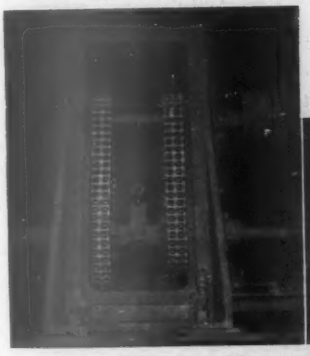
Pipeline cleaning and coating machine

Rotary drawworks (heavy duty)

LINK-BELT COMPANY

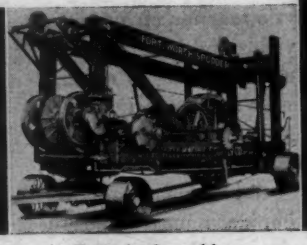
Indianapolis, Dallas, Houston, Los Angeles, Kansas City, Mo., New York, Toronto.

Also manufacturers of silent chain drives, rotary drilling chains, roller and ball bearings, and other transmission equipment, mud screens and cranes. 9084



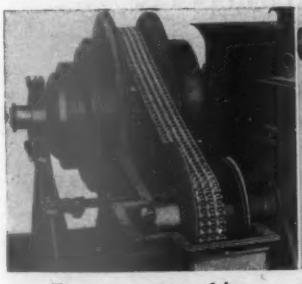
Independent rotary drive

Truck mounted service winch

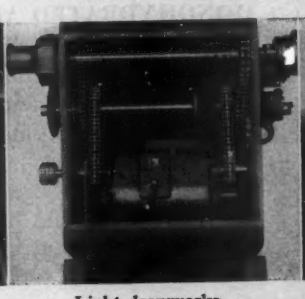


Cable tool spudder

Pipeline ditching machine



Torque converter drive



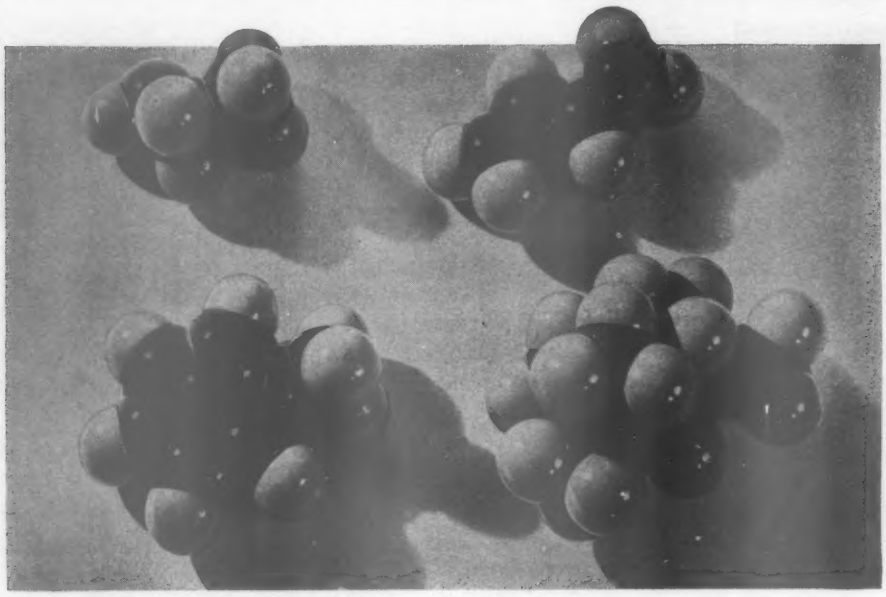
Light drawworks

Heavy duty transmission drive

Clean-out machine

LINK-BELT *Silverlink* ROLLER CHAINS

THEY CRACK BETTER WHEN THEY'RE DRY



Taking the moisture out of liquids and gases before they enter catalytic reaction chambers is a sound way to increase yields and improve control of the end products. In the making of materials for high-octane gasoline or for synthetic rubber, the process frequently goes faster and better when a dryer filled with Alorco Activated Alumina is on-stream ahead of the catalytic chamber.

Alorco Activated Alumina removes moisture from liquids and gases down to dew-points below –150° F. Many drying installations have been on the job for years.

In addition to its work as a moisture-remover, several grades of Alorco Activated Alumina are used in reactors as catalysts and catalyst carriers. The petroleum, explosives, and synthetic rubber industries use one or more of the Alorco Activated Aluminas as catalysts or carriers in several of their processes devoted to the production of war materials.

Other Aluminas suitable for catalytic purposes are:

TABULAR ALUMINA, a porous form of granular corundum, having high strength and permanence at elevated temperatures.

HYDRATED ALUMINA C-730, an extremely fine, powder alumina, which is active after an initial heating to 500° F.

MONOHYDRATED ALUMINA C-50, a substantially inactive powder alumina, with particle size of about one micron.

If you are making war materials requiring the use of catalysts and catalyst supports, write for samples. ALUMINUM COMPANY OF AMERICA (*Sales agent for* ALUMINUM ORE COMPANY) 1967 Gulf Building, Pittsburgh, Pa.

ALORCO

ALUMINUM ORE COMPANY

ALUMINUM AND FLUORINE COMPOUNDS

Hastelloy Alloys

are Strong and Tough!—and Highly Resistant to Corrosive Media . . . .

Hastelloy alloys—types A, B, C, and D—combine outstanding corrosion resistance with excellent physical properties. Each was especially developed to withstand the action of one or more of the common mineral acids or other strongly corrosive agents over a wide range of temperatures and concentrations. Alloys A, B, and C compare in tensile properties to high-strength steels, while alloy D possesses high hardness and wear resistance.

Shown below is a condensed table of mechanical properties of the Hastelloy alloys. For more complete information on mechanical and physical properties, penetration test results, available forms and methods of fabrication, send for the 40-page booklet, "Hastelloy High-Strength Alloys."

MECHANICAL PROPERTIES OF HASTELLOY ALLOYS

	Hastelloy Alloy A		Hastelloy Alloy B		Hastelloy Alloy C		Hastelloy Alloy D
	Cast Metal	Rolled Metal Annealed	Cast Metal	Rolled Metal Annealed	Cast Metal	Rolled Metal Annealed	Cast Metal
Ultimate Tensile Strength, lb. per sq. in.	69,000-77,500	110,000-120,000	75,000-82,000	130,000-140,000	72,000-80,000	115,000-128,000	36,000-40,500
Yield Point, lb. per sq. in.	42,500-45,000	47,000-52,000	55,000-57,000	60,000-65,000	45,000-48,000	55,000-65,000	
Elongation in 2 in., per cent	8-12	40-48	6-9	40-45	10-15	25-50	0
Reduction of Area, per cent	16-18	40-54	10-13	40-45	11-16		0
Hardness, Rockwell Brinell	B 85-94 155-200	B 94-97 200-215	B 92-99 190-230	B 96-100 210-235	B 89-97 175-215	B 84-95 160-210	C 50-55
Izod Impact Strength, ft.-lb.	25-35	62-77	11-16	68-78	9-14	34-40	
Erichsen Value, Depth in mm.		10-11		10-11		8-9	
Transverse Breaking Load, 12-in. span, lb. deflection, in.							5,000 0.070-0.080
Modulus of Rupture, lb. per sq. in.							78,000
Modulus of Elasticity, lb. per sq. in.	27,000,000		30,750,000		28,500,000		28,850,000

Note: The values given are averages and average ranges obtained with a limited number of specimens. They will serve as a reasonable guide for the engineer or designer planning equipment of Hastelloy alloys.

HASTELLOY TRADE MARK

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

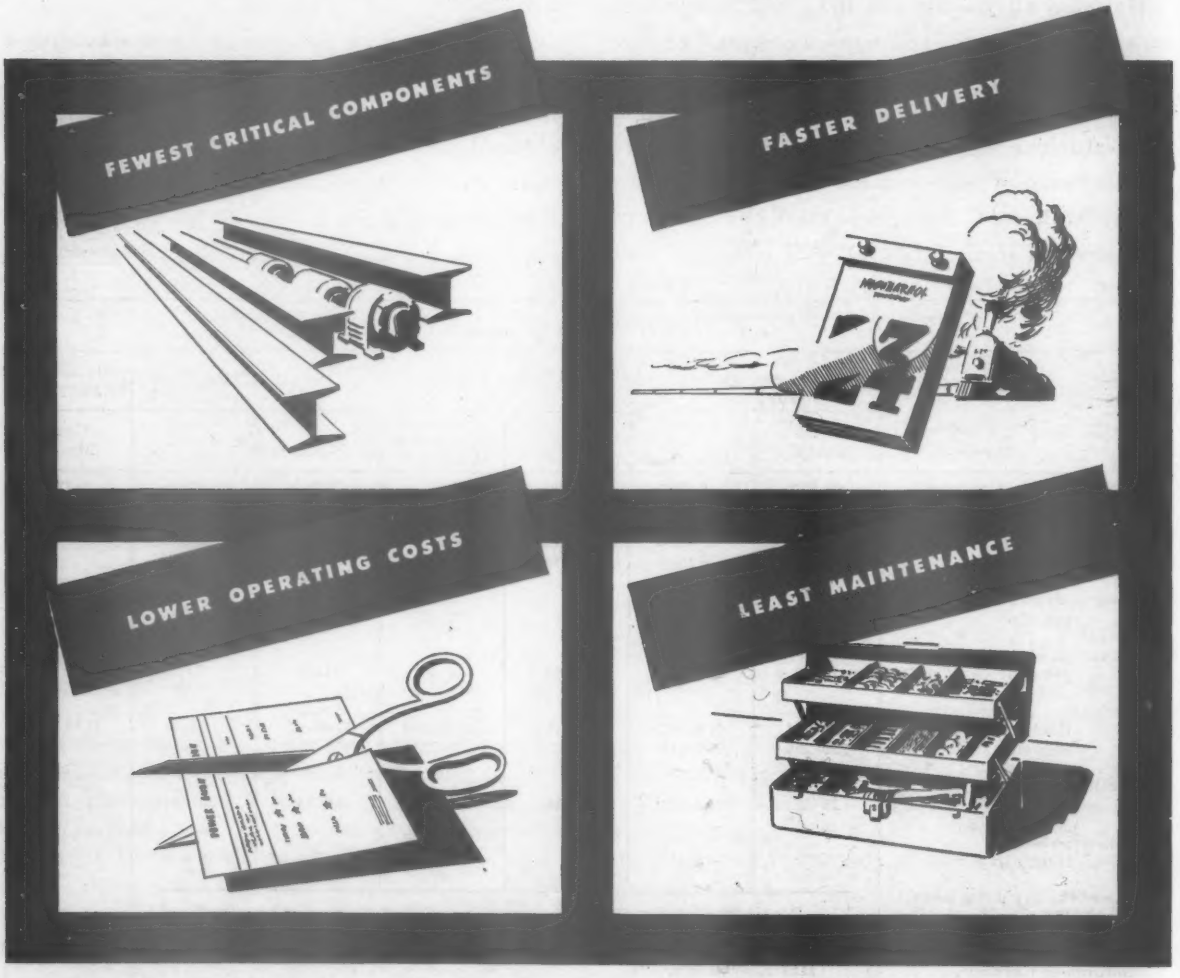
New York, N. Y. UCC Kokomo, Ind.

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

HIGH-STRENGTH NICKEL-BASE ALLOYS FOR CORROSION RESISTANCE

The word "Hastelloy" is a registered trade-mark of Haynes Stellite Company.

Today *these 4 fundamental facts dictate the specification of* Atmospheric Aerator Type Cooling Towers



FLUOR BUILDS both Atmospheric Type Cooling Towers and Mechanical Draft Cooling Towers. To those concerned with the specification of a cooling tower, Fluor is ably qualified to give unbiased counsel in the selection of the type of tower best suited for cooling process water, for any service, in any location, in any quantity.

Fluor believes that today, *under War conditions,* the specification of an Atmospheric Aerator Type Cooling Tower is dictated by the following four fundamental facts which make substantial contributions to the war effort.

Fact No. 1. An Atmospheric Aerator Cooling Tower uses fewest critical components. Your specification of an atmospheric tower means that steel, brass, aluminum, motors, fans, gears, switches, conduit and other hard-to-get materials, essential to the Mechanical Draft Types, are released for critical armament uses, as are the thousands of man-hours required for their manufacture, assembly and shipment.

Fact No. 2. An Atmospheric Aerator Cooling Tower can be delivered faster,—often three times quicker than towers of the Mechanical Draft Type. Because the production of critical

components for Mechanical Draft Towers is wholly or in greater part in the hands of sub-manufacturers, the final delivery of a Mechanical Draft Type is dependent on these sub-manufacturers. On the other hand, the manufacture of an Atmospheric Aerator Type Cooling Tower is controlled by Fluor. Throughout the whole defense and war program Fluor has never failed to meet or beat scheduled delivery dates. This record will continue; Fluor is geared to do it.

Fact No. 3. An Atmospheric Aerator Cooling Tower costs less to operate, because it requires least horsepower. There are no fan motors to operate. Here again, power, essential to war industries, is conserved to relieve the power shortage.

Fact No. 4. In an Atmospheric Type Tower, maintenance costs are negligible. Mechanical devices, such as motors, gears and fans, in a Mechanical Draft Type Tower require attention, — entail costs in both operation and upkeep. Maintenance like this and the man-power attendant to it, are eliminated with the specification of an Atmospheric Aerator Cooling Tower.

On the basis of the above four facts, the only limiting factors making the specification of Mechanical Draft Towers mandatory are (1) lack of space for the erection of the Atmospheric Type and (2) extremely subnormal wind conditions. You may ask, "How can we be certain that a Fluor Atmospheric Aerator Cooling Tower is the absolute correct specification under any conditions?"

Fluor Engineers will gladly give specific, unbiased answers to this question after analysis of your problem. Since Fluor makes all types of cooling towers our thinking is completely independent. If analysis shows that the Mechanical Draft Type Tower is the answer to your problem, Fluor will cooperate by furnishing expert documentary evidence of essential need as a means of assisting you in obtaining the necessary directive.

These, then, are the facts why Fluor recommends your specification of Atmospheric Aerator Type Cooling Towers for the duration. Wire or airmail your inquiry for prompt action. *Be Sure with Fluor.*

COOLING TOWER DIVISION OF THE FLUOR CORPORATION LTD.

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ACTION SHOTS OF PIPE LI
THAT WILL
DEFY RUS

ALL of these pipe lines and service lines have been protected against corrosion with NO-OX-ID and NO-OX-IDized Wrapper. The pipe is coated with NO-OX-ID which is double acting . . . mechanically by excluding moisture and oxygen and chemically by inhibiting any underfilm corrosion which may be present.

NO-OX-IDized Wrapper completes the water vapor barrier and provides high dielectric protection. Both are applied simultaneously by stationary machine, traveling machine, or by hand. Write for complete information.

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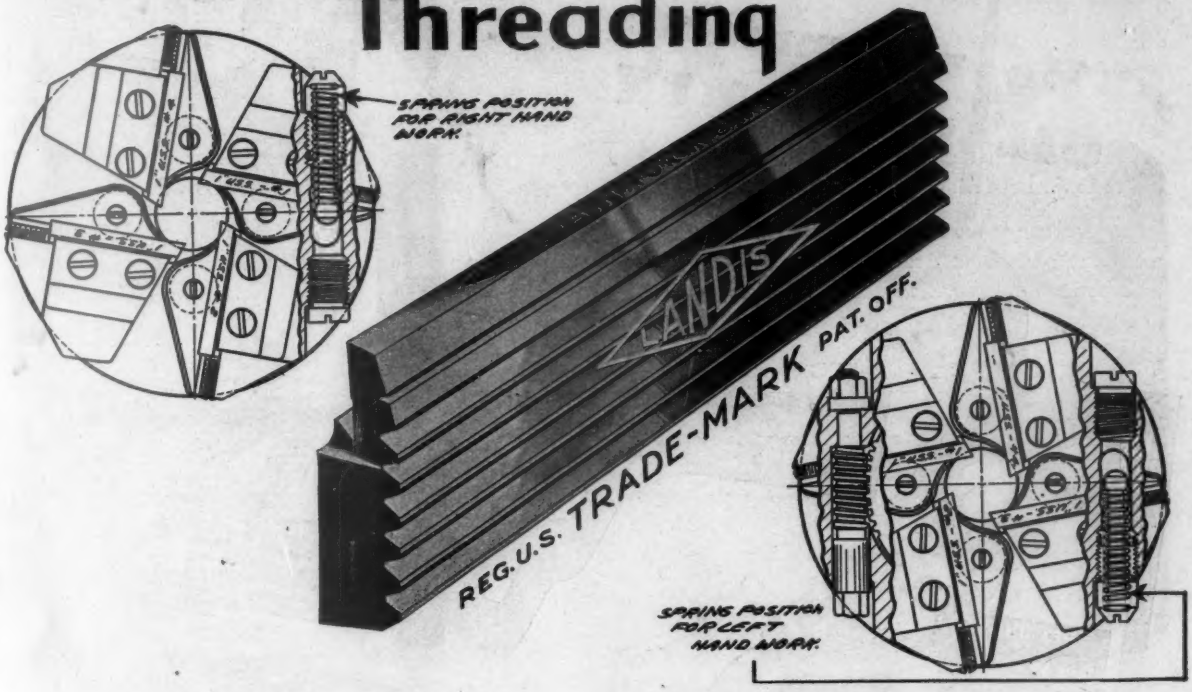
"THE LEADER FOR 25 YEARS"

NO-OX-ID
IRON RUST
rust preventive

LANDIS CHASERS Can Be Used For Both RIGHT and LEFT Hand Threading



12 Features of the LANDIS TANGENTIAL CHASER

1–Permanent throat permits close to shoulder threading throughout life of chasers
2–Rake angle range covers all machinable materials
3–Free cutting condition permits maximum cutting speeds
4–Simple grinding operation renews entire cutting edge and leading feature
5–Line contact with work lessens friction and minimizes thread distortion
6–Leading feature insures thread of accurate lead
7–Lateral absorption of cutting strain reduces vibration and chaser breakage
8–Right and lefthand threading feature reduces chaser equipment
9–Standard chasers thread all diameters with proper chaser holders
10–Interchangeability of chasers lowers operating cost
11–Chaser length provides exceptionally long life and low tool cost
12–Permanent throat gives equal distribution of cut

With Landis Tangential Chasers, Tool Inventories and Installation Costs Are Materially Reduced Since . . .

The same chasers may be employed for both right and left hand work merely by grinding the proper cutting angles at both ends of the chasers. For cutting left hand threads, use left hand chaser holders and reverse the action of the spring as illustrated above.

The Finest Thread Cutting Tool in Industry

LANDIS MACHINE COMPANY

WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

REPRESENTED IN THE DOMESTIC OIL FIELDS BY:

Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

He recommends OIL to OIL MEN

REX M.E.
REX DEEPWELL
A. P. I. 3 — A. P. I. 4
Ultimate strength — 60,000 and 130,000 lb. An all-around chain recommended for 70% of the conditions encountered in modern oil field drilling.
REX CHAMPION
A. P. I. 3 — A. P. I. 4
Ultimate strength 75,000 and 170,000 lb. For extremely hard and deep drilling, where load is the main factor.
REX UNIVERSAL
3125 — D3125
Furnished as a single and/or double strand chain with ultimate strengths of 115,000 and 230,000 lb. For the deepest and fastest oil well drilling.

REX MECHANICAL ENGINEERING—Rex M. E.—has worked most of his life to make oil well chains last longer. He knows he has done well and would like you to help him to do still better by keeping your chains well lubricated.

For this he recommends light oil—approximately S. A. E. #30 or 40 for ordinary conditions. The viscosity can, of course, be varied to suit extremely hot or extremely cold weather.

He recommends good oil only. The poorer grades fail to produce the required oil film at high pressures. Remember that crude oil is *not* a lubricant. Heavy oil or grease should *not* be used because they seldom reach articulating chain joints.

Rex Oil Well Chains respond to lubrication care better than any others. Rex Mechanical Engineering—Rex M. E.—has provided them with two sets of two oil holes each. Two of them are always in a position to receive oil sent by centrifugal force to the pins.

Your Rex supply store still stocks and sells the three Rex Oil Well Chains.

For additional information, check your Rex Supply Store or write Chain Belt Company, 1619 West Bruce Street, Milwaukee, Wisconsin.

REX

OIL WELL CHAINS

2000 other Types and Sizes of Chain Belts

CHAMPION • DEEPWELL • UNIVERSAL

CHAIN BELT COMPANY OF MILWAUKEE

LADISH

DROP FORGINGS

ARMY E NAVY

Ladish leadership in drop forgings springs from the sharp focus of its superior experience and technical talent on the constant target, "Quality." Unexcelled facilities under constant metallurgical control produce forgings meeting uniformly, the most exacting engineering requirements.

LADISH DROP FORGE CO.

PLANT AND GENERAL OFFICES: CUDAHY, WISCONSIN

TO MARK PROGRESS

Unique

in Properties and Performance

Thirty-five foot high "Karbate" absorption tower equipped with graphite trays and bubble caps. One of many examples of the application of these materials.

NATIONAL AND KARBATE
TRADE-MARK TRADE-MARK

CARBON AND GRAPHITE PRODUCTS

are being used successfully in a wide range of important applications in the mechanical, electrical and process industries because of the many advantages offered by their unique combination of physical and chemical properties.

- Resistance to severe thermal shock.
- No deformation at high temperatures.
- Not wet by molten metals — no sticking.
- Mechanical strength maintained at high temperatures.
- No reaction with most acids, alkalies and solvents.
- Low thermal expansion.
- High rate of heat transfer (Graphite and Graphite Base "Karbate" products).
- Low rate of heat transfer (Carbon and Carbon Base "Karbate" products).
- Good electrical conductivity.
- Self-lubricating.
- Available in impervious grades.
- Available in highly permeable (Porous Carbon and Graphite) grades.
- Easily and accurately machined and fabricated.
- Molded and extruded in special shapes when quantity justifies.

Carbon and graphite materials are available in the form of:
Brick, Blocks, Beams, Plates, Flat or Hollow Tile,
Slabs, Pipe, Tubes, Rods, Cylinders, Cement, Paste.

A variety of sizes permits fabrication of all types of equipment from small intricate parts to huge all-carbon structures.

•

Conventional design has been improved and simplified new design made possible by the use of "National" and "Karbate" carbon and graphite products. Following are some of the more important applications:

Heat Exchangers . . . Towers and Tower Equipment . . . Raschig Rings and other Tower Packings . . . Pipe, Valves and Fittings . . . Tanks, Tank Linings and Miscellaneous Containers . . . Filter and Diffuser Elements . . . Packing, Piston and Seal Rings . . . Bearings . . . Molds, Mold Plugs, Inserts and Stools . . . Ground Anodes . . . Welding Electrodes, Rods, Plates and Paste . . . Brushes and Contacts . . . Miscellaneous Electrical and Chemical Specialties.

NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
UCC
CARBON SALES DIVISION, CLEVELAND, OHIO
General Offices: 30 East 42nd St., New York, N. Y.
Branch Sales Offices: New York, Pittsburgh, Chicago, St. Louis, San Francisco

PURE BENZENE

...for synthetic rubber
...for aviation gasoline

Shell Development Company offers a process for recovering a high-purity benzene. Where the pure benzene is needed, the Shell process will recover it efficiently and at a low cost.

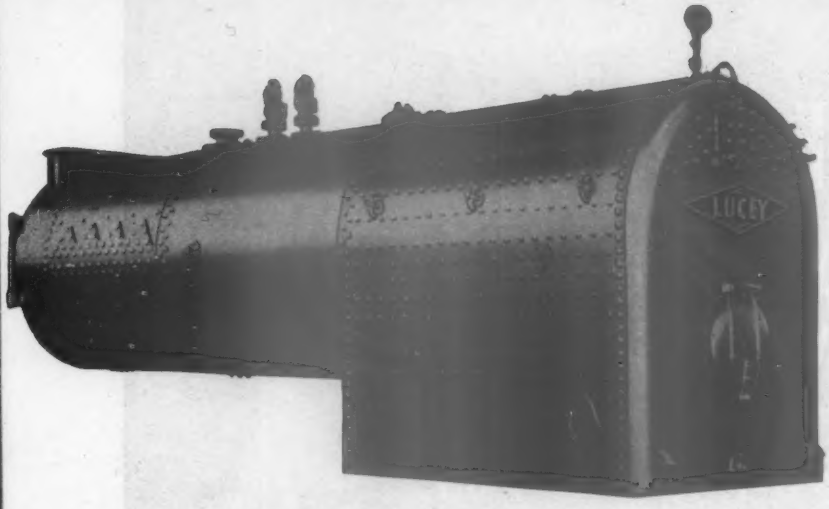
SHELL EXTRACTIVE DISTILLATION PROCESS

For details on this process and our licensing arrangement, wire or write Shell Development Company at 50 West 50th Street, New York City.

SHELL DEVELOPMENT COMPANY

LUCEY

LUCEY *Steam Drilling Equipment*



LUCEY
HI-TENSILE STEEL OIL COUNTRY BOILER

150 Horsepower
250, 300, 350 Lb. Working Pressure

LIGHTEST WEIGHT BOILER PER HORSEPOWER ON THE MARKET

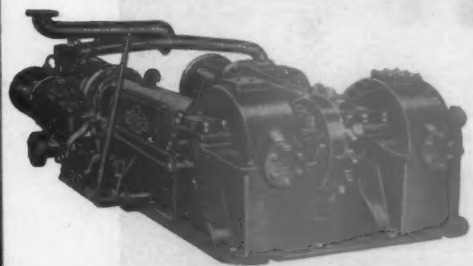
Large firebox—60"x72"x96" provides a heating surface of 178 sq. ft. and a furnace volume of 233 cu. ft. Total heating surface 1505 sq. ft. Greater burner space together with large furnace volume insure adequate combustion and permit efficient firing at 200 to 300 percent of the A.P.I. horsepower rating.

Seamless LUCEY firebox (patented) eliminates overheated and burnt rivets and leaky seams. 20" space between crown sheet and outside wrapper provides ample steam space. Good water circulation with 4" water space all around the firebox. Water volume—2310 gallons. Easy to clean.

LUCEY Boilers are constructed strictly to the requirements of the A.S.M.E. Boiler Code and can be furnished to meet the regulations of other countries.

WHELAND-LUCEY GM-6000-B

12" x 12" TWIN CYLINDER STEAM DRILLING ENGINE



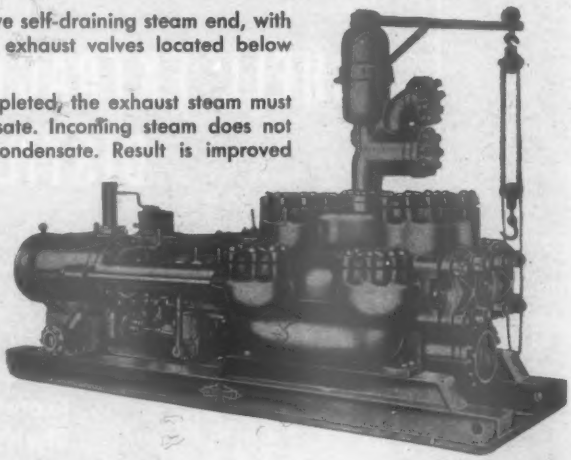
A powerful steam-saving engine equipped with efficient locomotive *"monkey motion"* valve action affording variable cut-off with constant lead of the piston type valves. Crank and crossheads totally enclosed and run in bath of oil. Valve mechanism is easily accessible for adjustment or repair. Effortless reversing and easy to handle. Net weight 9,700 lb.

WHELAND-LUCEY DUPLEX STEAM SLUSH PUMPS

H-20000-BA 16½"x8"x20" **H-20000-AA 15½"x8"x20"**

These slush pumps have self-draining steam end, with combined steam and exhaust valves located below the steam cylinders.

As each stroke is completed, the exhaust steam must blow out the condensate. Incoming steam does not have to evaporate condensate. Result is improved thermal efficiency — better steam cushion —increased mean effective steam pressure — elimination of broken rings and cylinder heads — more mud and higher mud pressure — smoother operation and reduced steam consumption. Less fuel required.



LUCEY EXPORT CORPORATION

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OIL WELL LUCEY SUPPLIES

Boilers
Boiler Casings
Burners, Gas
Cable Tools
Casing
Casing Lines
Crown Blocks
Derricks
Diesel Hook-Ups
Drawworks
Drift Recorders
Drill Pipe
Drilling Lines
Elevators
Engines
Fishing Tools
Line Pipe
Pipe Cleaners
Portable Outfits
Pull Rods
Pumps, Power
Pumps, Steam
Rock Bits
Rotaries
Sand Lines
Shale Separators
Slim Hole Outfits
Sprocket Chain
Sucker Rods
Swabs
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Tanks, Steel
Trailers
Traveling Blocks
Tubes, Boiler
Tubing
Turbo Generators
Tongs
Tool Joints
Wire Rope

OIL on the Warpath

Oil goes to war over pathways made of steel. From wells to refineries, to domestic distribution centers, to overseas shipping points, it flows safely, quickly, constantly—through thousands of miles of Republic Electric Weld Line Pipe.

To speed the flow of fighting fuels to our planes, tanks and ships, Republic Steel is performing war jobs in every step of oil and gasoline production. At the well, there's Republic Alloy Steel in drilling tools and other field equipment. In the hole, Republic Electric Weld Casing and Tubing bring precious crude to the surface. Republic Electric Weld Line Pipe takes it where it must go. At the refinery, Republic Steel Plates in storage tanks, Republic Electrunite Tubes in heat exchangers, Upson Studs, Bolts, Nuts and Rivets at pipe and plate connections are only a few of the other Republic Steel Products on war duty in the Oil Industry.

And in these wartimes, when we all must make better use of the equipment we have, oil country products made of Republic Steel are proving that they can stand up under the gruelling emergency war service we need today.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND, OHIO
Berger Manufacturing Division • Calvert Division
Niles Steel Products Division • Steel and Tubes Division
Union Drawn Steel Division • Truscon Steel Company
Export Department: Chrysler Building, New York, N. Y.

WELL WORTH KNOWING

The nine outstanding features of Republic Oil Country Tubular Goods:

Uniform Wall Thickness
Uniform Roundness
Uniform Diameter
Easy to Weld
Uniformly Straight
Uniform Strength
Freedom from Scale
Easy to Bend
Long Lengths

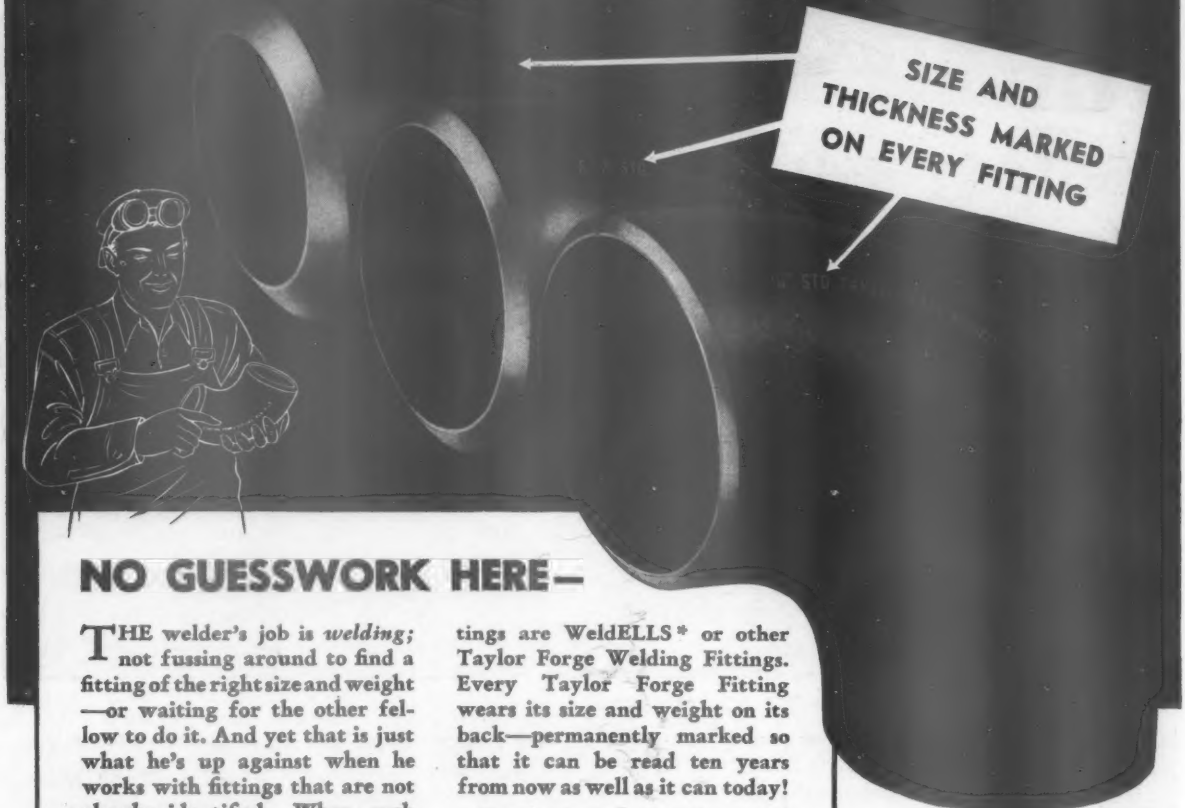
Get the details about these important features and their advantages to you, as described in "The Pipe of Progress," an illustrated 44-page book. It's free.

REPUBLIC *Electric Weld*

REPUBLIC STEEL PRODUCTION FOR VICTORY

LINE PIPE . . . NORMALIZED CASING AND TUBING

WeldELLS *have everything*



NO GUESSWORK HERE—

THE welder's job is *welding;* not fussing around to find a fitting of the right size and weight —or waiting for the other fellow to do it. And yet that is just what he's up against when he works with fittings that are not clearly identified. When such things happen it isn't surprising that the welder may "take it out on the job"—particularly when he's working against time as most everyone is today.

Anything can happen when unmarked or poorly marked fittings are used. The wrong size may be delivered, and not discovered until too late. A helper may lug a heavy fitting a long way from the stockroom, only to do it all over again.

But there's little chance of this sort of thing when the fittings are WeldELLS* or other Taylor Forge Welding Fittings. Every Taylor Forge Fitting wears its size and weight on its back—permanently marked so that it can be read ten years from now as well as it can today!

By eliminating the danger of using wrong thickness fittings, this feature ranks with the many features of WeldELLS that contribute to sound engineering design. And by simplifying and speeding up welding, it ranks with the many features that contribute to convenience and economy.

Yet it is just one of many reasons why WeldELLS are known as the fittings that have *everything*—everything *any* welding fitting has; some things that no other has.

TAYLOR FORGE & PIPE WORKS
General Offices & Works: Chicago, P. O. Box 485

● WeldELLS are just one of many Taylor Forge Products that are vital to war and victory. An example is huge rolled steel rings—an important part of U. S. tanks now in action.

★WeldELLS alone have all these features

In addition to the feature described, they include:

▶ **Seamless**—greater strength and uniformity.

▶ **Tangents**—keep weld away from zone of highest stress—simplify lining up.

▶ **Precision quarter-marked ends**—simplify layout and help insure accuracy.

▶ **Selective reinforcement**—provides uniform strength.

▶ **Wall thickness never less than specification minimum**—assures full strength and long life.

▶ **Machine tool beveled ends**—provides best welding surface and accurate bevel and land.

▶ **The most complete line of Welding Fittings and Forged Steel Flanges in the world**—insures complete service and undivided responsibility.

* * *

* WeldELLS and many other Taylor Forge Products are produced in Byers Genuine Wrought Iron.

NEW YORK OFFICE: 50 CHURCH STREET • PHILADELPHIA OFFICE: BROAD STREET STATION BLDG.

YOU wouldn't build a drafting table with rubber legs!

—of course you wouldn't. Rubber is a critical and necessary material for many things—but you'd turn out some mighty queer drawings on a drafting table with legs of latex.

And—we hope—you won't do anything as ridiculous when you buy open steel floors. There's a tendency these days to cut corners on specifications—but such cuts can easily go so far that lives are jeopardized—and usually at a cost for the cut-specification floor that is higher than when *standard* specifications are followed.

Open Steel *GRATING* Floor manufacturers have *not* changed their engineering because of the war. Their formulas and practices were already the simplest and best. Open Steel Floor *GRATING* is *factory* fabricated to fit the specific job at hand—does *not* require extensive field welding or reinforcing.

To get the best Open Steel Floor at the lowest cost, specify Open Steel Floor *GRATING* made by members of this Institute. This is no time to take chances with deflections greater than pre-war standards.

Write today for a guide to specifications and standard practices to the Open Steel Flooring Institute, First National Bank Bldg., Pittsburgh, Pennsylvania.

OPEN STEEL FLOORING INSTITUTE, INC.

POWELL has the valves YOU need!

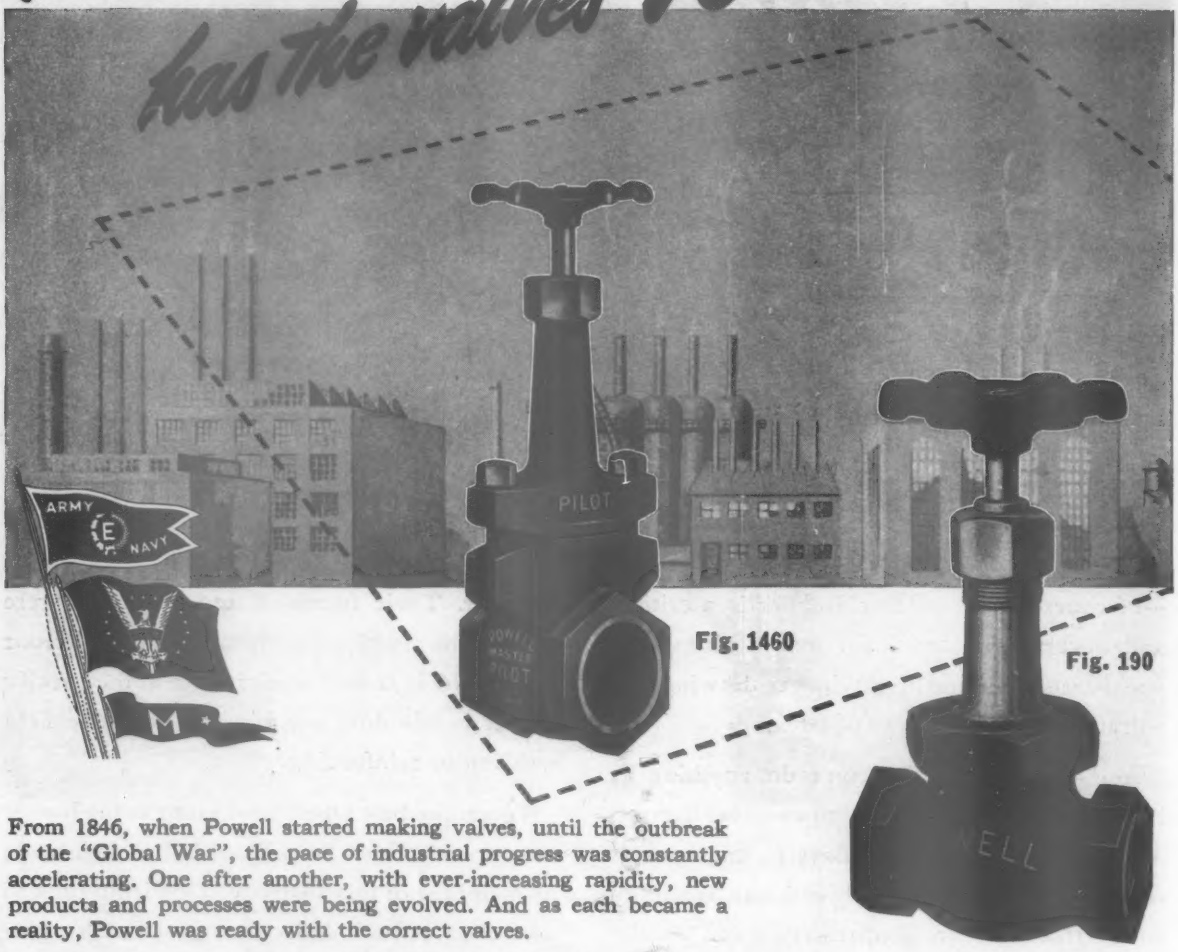


Fig. 1460

Fig. 190

From 1846, when Powell started making valves, until the outbreak of the "Global War", the pace of industrial progress was constantly accelerating. One after another, with ever-increasing rapidity, new products and processes were being evolved. And as each became a reality, Powell was ready with the correct valves.

Since Pearl Harbor the rate of acceleration has reached a peak. And—as in the past—Powell Engineering has been meeting every challenge*. Let us help you with any valve problem you may have—Powell has the valve you need—or we'll design one for you.

*For the contribution we are making toward winning this War, we have been honored with the Army-Navy "E", the Maritime "M" and the Victory Fleet Flag.

Fig. 190—Iron Body Bronze Mounted "Irenew" Globe Valve for 150 pounds W. P. Screwed ends, union bonnet and regrindable, renewable hard bronze plug-type seat and disc.

Fig. 1460—Iron Body Bronze Mounted "Master Pilot" Gate Valve. Screwed ends, bronze rising stem, bolted flanged bonnet and taper wedge bronze solid disc. Sizes ¼" to 2" for 150 pounds W. P.; 2½" to 4" for 125 pounds W. P. Also available in All Iron—Fig. 1462.

The Wm. Powell Company

Dependable Valves Since 1846

Cincinnati, Ohio

POWELL VALVES

THERE'S A G-E EXPLOSION-PROOF MOTOR TO MEET IT

No one type of motor is "best" for all kinds of hazardous locations. The *right* selection may eliminate the need for fire-walls to isolate the motor, and for awkward remote-drive arrangements.

Our engineers offer to work with you to select the motor, control, and other auxiliary equipment that best combines simplicity with security on the job.

General Electric builds the most complete line of explosion-proof and dust-tight motors available, tested and listed by Underwriters' Laboratories, Inc., for specific industrial hazards.

Most of these motors are as compact as standard open types, and require even less maintenance because of their totally enclosed construction.

Information on motorizing equipment in hazardous places is given in our publication No. GEA-3647. For this or any other motor assistance that can help speed war production, just call your General Electric Representative. Or write General Electric Co., Schenectady, New York.

Three More G-E "Firsts" in Motors for Hazardous Places

EXPLOSION-PROOF TO 600 HP

Totally enclosed squirrel-cage motors up to 600 hp are now listed by Underwriters' Laboratories, Inc., for Class 1, Group D, locations, where atmospheres may contain gasoline, petroleum vapors, acetone, alcohols, natural gas.

VERTICAL MOTORS FOR FUEL PUMPS

Vertical, hollow-shaft motors with a non-reverse ratchet and with nonsparking parts are now listed as explosion-proof for Class 1, Group D, conditions. They meet requirements of pumping gasoline from underground storage tanks.

WOUND-ROTOR MOTORS TO 600 HP

The flexible speed characteristics of wound-rotor motors are also now available in large-size, explosion-proof construction. U. L. listed for Class 1, Group D, locations.

GENERAL ELECTRIC

IF IT'S PIPING CONTACT FLORI

The construction of a power dam requires huge quantities of fabricated pipe and plate steel products . . . All this is within our scope

Fabricated Piping—for steam, water, air, oil, gas, chemicals • Random mill or cut lengths, bent, coiled, threaded, welded, flanged • Valves, Pipe Fittings

In brief: anything in tubular or plate steel fabrication. Send your inquiries.

FLORI PIPING

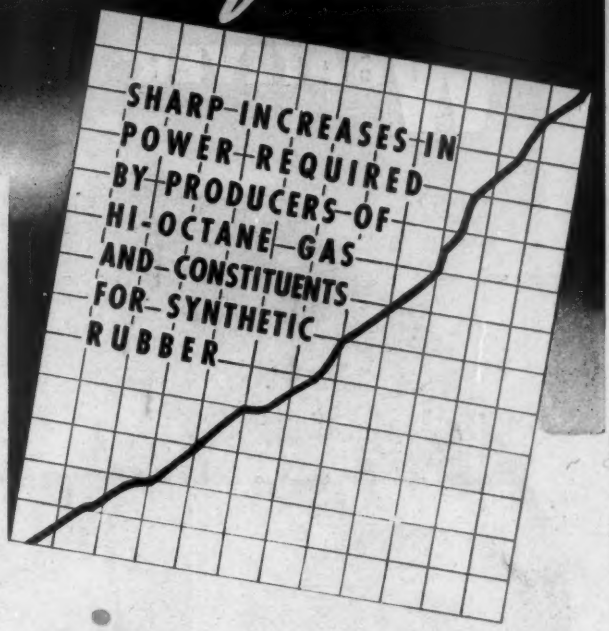
THE FLORI PIPE COMPANY • ST. LOUIS—CHICAGO

Are You in This Classification?

Wherever power plants are in operation, you'll find a high percentage equipped with Ross Surface Condensers.

This is particularly true of refineries. In 1942, they alone purchased 26 Ross condensers. Most of these units went to companies doing repeat business with Ross over a long period of time. This expresses most convincingly their approval of and confidence in the distinct advantages of Ross design and engineering performance.

If in increasing your hi-octane gas facilities you, too, are faced with the need for additional power, have your nearest Ross representative submit practical recommendations on your surface condenser requirements.

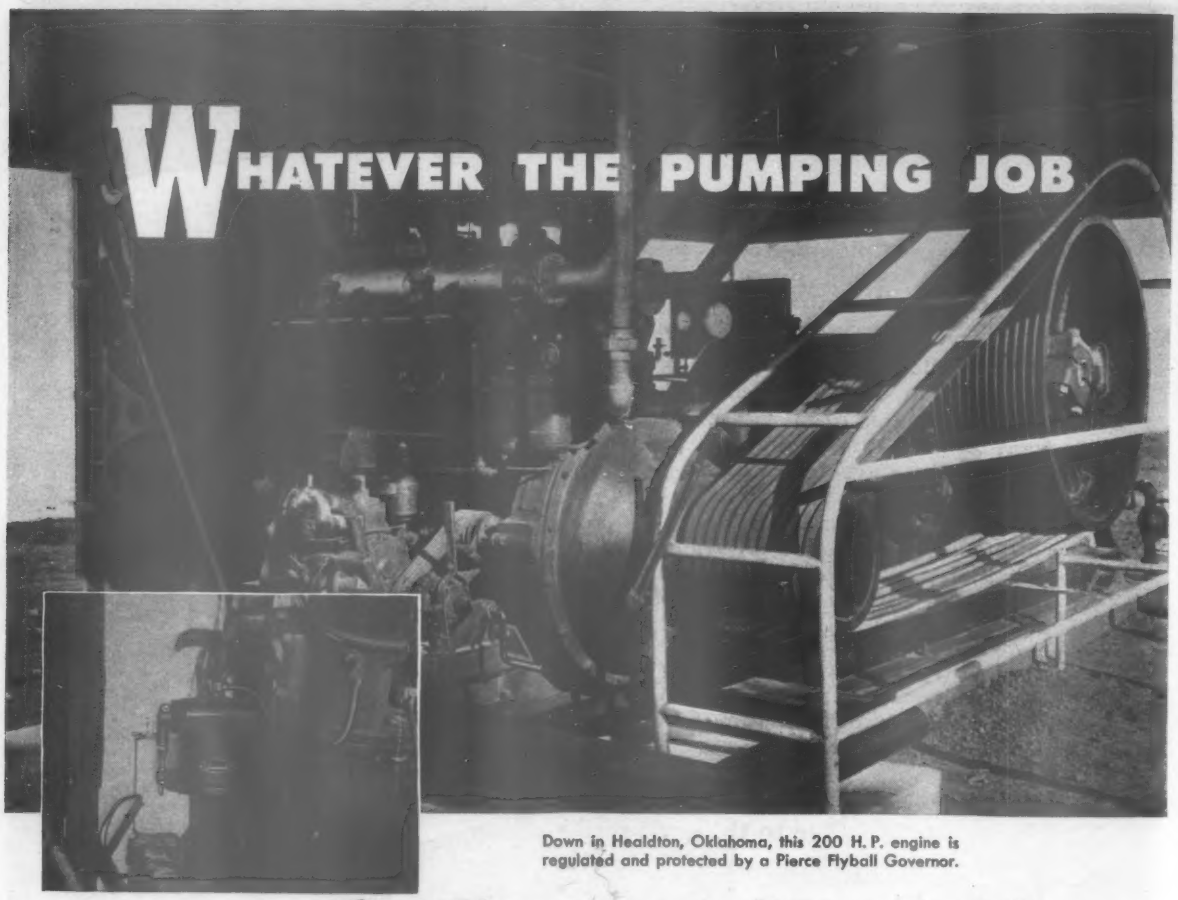


Manufacturers of All Kinds of Heat Exchangers for over a Quarter Century

ROSS HEATER & MFG. COMPANY, INC.

Division of American Radiator and Standard Sanitary Corporation

MAIN OFFICE AND PLANT, 1409 WEST AVENUE BUFFALO N. Y.



Down in Healdton, Oklahoma, this 200 H. P. engine is regulated and protected by a Pierce Flyball Governor.

HOW TO MAKE YOUR GOVERNORS LAST!

Like others manufacturing for war needs, Pierce production is for war and essential industry. For this reason new governors can be supplied only on a priority basis. But Pierce calls attention to these easy measures which will make your present Pierce Governors last and give the best service.

- **CLEAN GOVERNORS** once a month with kerosene, gasoline, or prepared cleaner.
- **INSPECT AND CHECK GOVERNORS** each week when in continuous operation.
- **CHECK OIL LEVEL** every day in manually lubricated governors. SAE 20 is recommended at this time of year.
- **LINE UP** driving pulleys or gears accurately when reassembling governor after cleaning.

Should your governor need repair or reconditioning send it to the factory with the necessary preference rating certificate.

Pierce Keeps Power Steady and Protects the Engine!

● Whether it's pipe-line pumping or oil-well pumping . . . oil-well drilling or hoisting . . . or any other heavy oil-field job . . . engine speed of the power unit must be kept *constant,* regardless of any change in load. This is *essential* for efficient, economical operation, and protection of power units.

That's why it pays to be so careful about the governor on your equipment—to see that it is a Pierce. You can depend on Pierce Flyball Governors to respond instantly to any change in load condition, keeping engine speed constant, yet providing exactly the amount of power that's needed! Pierce regulation gives positive protection against destructive overspeed . . . is accurate, automatic, and unfailing!

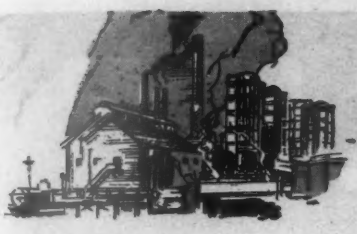
Built by the world's largest governor manufacturer, Pierce Flyball Governors are precision instruments, built carefully and sturdily to last a long, long time.

THE PIERCE GOVERNOR COMPANY, 1659 OHIO AVENUE, ANDERSON, IND.

NOW... and after the war... insist on Pierce Flyball Governors when you purchase new equipment!

Pierce Governors

STANDARD SINCE 1913



Gases and Liquids

FOR SYNTHETIC RUBBER, TOLUOL, AVIATION GASOLINE, LUBRICANTS

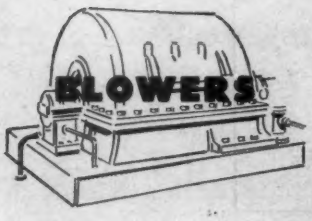
Now, more than ever before, the handling of gases and liquids is a major task for the Petroleum Industry. It is an ever-changing problem involving new gases, new liquids, higher temperatures, higher pressures, greater volumes.

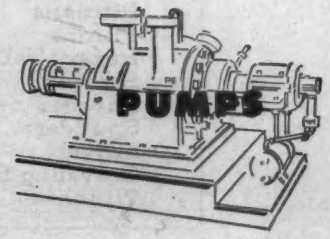
Inventive genius and ability to recognize a problem and lick it have always been associated with those in the Oil Industry. Due to their never-ceasing research, development, and production, we have the countless products so essential to war and peace.

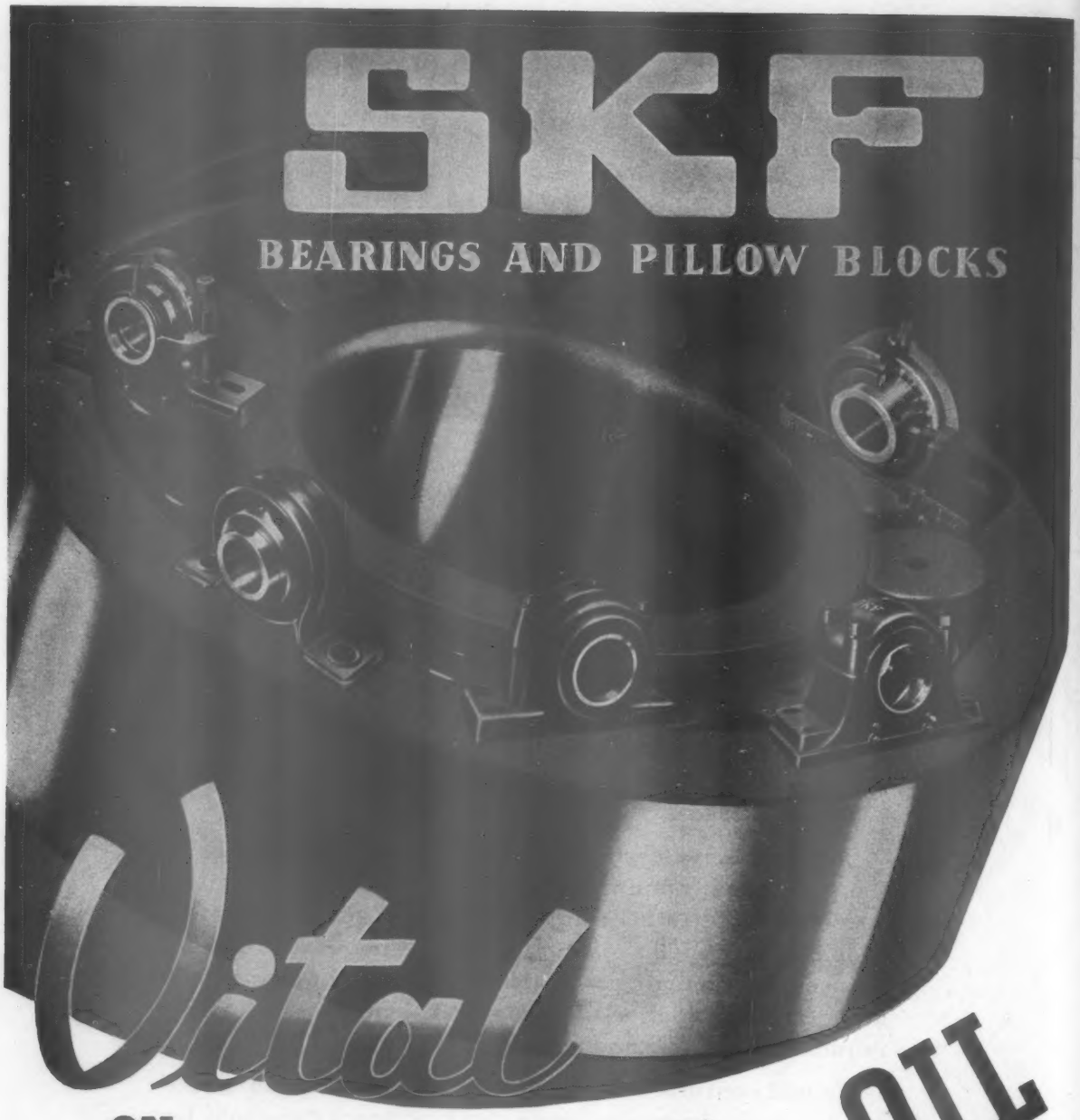
Sustained development of compressors and pumps to handle the many and varied gases and liquids has permitted Ingersoll-Rand to help the Oil Industry solve many of its problems. Through the years, new machines have been built to meet ever-changing conditions—always built by men who appreciate the high standards of efficiency and reliability required by refiners and producers.

We will continue to meet and, where possible, to anticipate such requirements, no matter how severe these may be. Ingersoll-Rand Company, 11 Broadway, New York, N. Y.

Ingersoll-Rand







ON

- Compressors
- Countershafts
- Crown Blocks
- Draw-Works
- Drilling Rigs
- Drives
- Engines
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- Pumps
- Rotary Tables
- Screens
- Sheaves
- Spudders
- Swivels
- Traveling Blocks
- Winches

AS OIL

TO VICTORY!

Without smoothly turning parts, the high speeds with which machines handle Oil today would be impossible. TIME is the essence of Victory. Saving it on oil field machinery of all kinds are SKF Spherical Roller Bearings. Inside SKF's are aligning properties that prevent cramping as they compensate for distortions of frames and underpinning. High capacity is always available for useful work. Load distribution is equalized. No adjustments are needed. As the years roll by, their ability to PERFORM is revealed in the accelerated production of oil for the planes, tanks, jeeps, and other equipment overseas. 5294

SKF INDUSTRIES, INC., PHILADELPHIA, PA.

2.4 MILES OF CASING CEMENTED IN 82 MINUTES

With high bottom-hole temperature, Unaflo cement remained fluid and pumpable

In the Old Ocean Field in south Texas, 12,709' of 7" O. D. casing was cemented with 1200 bags of Unaflo cement in 82 minutes. Bottom-hole temperature was close to 300° F.

Even though this was a two-truck job, the cementing crew had to work smoothly to complete it in such a short time. It was important that the cement slurry remain fluid and pumpable throughout the operation. It did. *Improved* Unaflo, the cement with a retarded set, was used. From the time mixing began until cement plug reached bottom, only 82 minutes elapsed.

Today, more than ever, it is important to safeguard vital drilling equipment. Delays and shutdowns can mean plenty of trouble. It pays to be safe. It pays to make sure, by using a cement with a high factor of safety. That means *improved* Unaflo, the cement that remains fluid and pumpable for extended periods under different hole temperatures and pressures.

For more details on the advantages of Unaflo oil-well cement see COMPOSITE CATALOG. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Amicable Building, Waco; Oklahoma City; Kansas City; Chicago; Birmingham.

You Get These Extras in Improved *Unaflo*

Characteristics

Composition is more uniform.

Reaction to different mixing waters found on different jobs is more uniform.

Retardation of setting time under different hole temperatures is more uniform.

Stiffening of slurry is not merely "slow." It is delayed, postponed, *retarded*. It remains fluid and pumpable for period of retardation, then hardens normally.

Advantages

Less mixing water required for sustained pumpability.

Stronger, denser, more impermeable seal is obtained with the heavier slurry.

Fluidity is maintained under different hole temperatures and pressures.

Pumpability is maintained after shutdowns for extended periods.

Factor of safety is higher.

OG-U-34

LTC

ANGLE GAS ENGINE-COMPRESSORS

IN THIS EQUIPMENT there is exemplified Worthington's half-century of research and experience in building compressors and internal combustion engines.

For refrigeration, air supply or gas compression, Worthington LTC units offer the solution to many major problems . . . by assuring uninterrupted operation over long periods, plus a term of life that is far beyond any current calculations.

Developed to meet the needs of the petroleum and gas industries, these LTC units are ready for other new and important war assignments.

FIVE SIZES . . . 400 TO 1000 HORSEPOWER

EFFICIENT

- Twin ignition . . . Complete fuel combustion
- Pressure fuel injection . . . No waste to exhaust
- Feather valves . . . Quick acting, less slippage
- Large valve area . . . Higher efficiency

ECONOMICAL

- Low installation cost . . . Engine shipped completely assembled
- Low foundation cost . . . Small floor space
- Low building cost . . . Small cheap buildings adequate
- Low operating cost . . . In fuel and maintenance

DEPENDABLE

- Pressure lubrication . . . Reduces wear
- Low-tension ignition . . . Maintains spark intensity
- Gear drive . . . Positive timing for valves and ignition
- Complete combustion . . . Reduces operating temperatures

WORTHINGTON

GC3-3A

WORTHINGTON PUMP AND MACHINERY CORPORATION • HARRISON, NEW JERSEY

MASTER-KEY to *Light-Ends Production!*

Throughout the development of natural gasoline recovery, Foxboro's progressive advances in control instrumentation have consistently helped to unlock each new processing accomplishment. That's why Foxboro always has been a major supplier of instruments in this field!

Typical examples of Foxboro's outstanding "firsts" are the Recording Flow Meter, Ratio Flow Control, the Stabilog Controller and the famous "Pot Stab" Controller.

Today, the newest-type alkylate and polymer units, as well as casinghead plants, have found their most exacting control requirements uniquely fulfilled by Foxboro's new control development, HYPER-RESET. Stabilog Controllers with this exclusive control function now are furnishing process *stability never even approached before!*

Write for Bulletin A-330 containing details of HYPER-RESET Stabilog Controllers . . . the master-key to today's light-end processes. **The Foxboro Company, 60 Neponset Ave., Foxboro, Mass., U.S.A.** Branches in principal cities of U. S. and Canada.

HYPER-RESET *Stabilog Controllers* evaluate the maximum of every disturbance by accurately measuring the *rate of change* at the start. Then, instantly apply *hyper*-corrective action. Produce smoother recovery in as little as ¼ usual time . . . with as much as 50% reduction in amount of upset!

ARMY (E) NAVY

Stabilog Controllers by **FOXBORO**

REG. U. S. PAT. OFF.

Old friend arrives . . . Thanks to you

When you're halfway around the world, trying to finish an important job, it's mighty pleasant to greet an old and very helpful friend you used to work with.

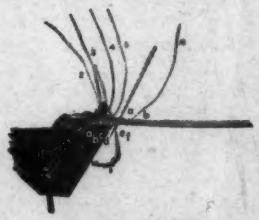
Back home, in scores of industries, the men now on palm-fringed shores learned an affectionate respect for the dependability of Wickwire Rope. Now when stout wire rope is more than ever a matter of life and death, the sight of a reel of *Wickwire* Rope brings double cheers.

These buddies of ours know that *you* need Wickwire Rope, too—to help in your speeded-up *production* of lots of things for them. So they're grateful when you make each length you now have last longer, so that more Wickwire Rope can be used to equip the Liberty Ships, and to send overseas.

But when you do need more of this friendly Wickwire Rope to help maintain your war-production pace, won't you please order it *without* reels, if lengths will permit, so that handier reels can be spared for the boys out there? Wickwire Spencer Steel Company, 500 Fifth Avenue, New York.

. . .

Wickwire Spencer was the first manufacturer in all New England to be awarded the Maritime M and Victory Fleet Flag for outstanding production accomplishments!



DO YOUR MEN KNOW HOW?

Our free book "Know Your Ropes" pictures the best ways to splice, attach sockets, etc. Also shows the right and wrong ways to use wire rope. In the hands of new men (and even old-timers) it can help you make your present wire rope last longer. Send for a free copy.

SEND YOUR WIRE ROPE QUESTIONS TO WICKWIRE SPENCER

WICKWIRE SPENCER STEEL COMPANY

WICKWIRE ROPE

Sales Offices and Warehouses: Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles, Tulsa, Chattanooga, Houston, Abilene, Texas, Seattle. Export Sales Department: New York City

WISSCO PRODUCT

TOUGH as they come!

Like tough soldiers of the American Armored forces, Formica pump valves and piston rings used in oil field and refinery equipment can take it.

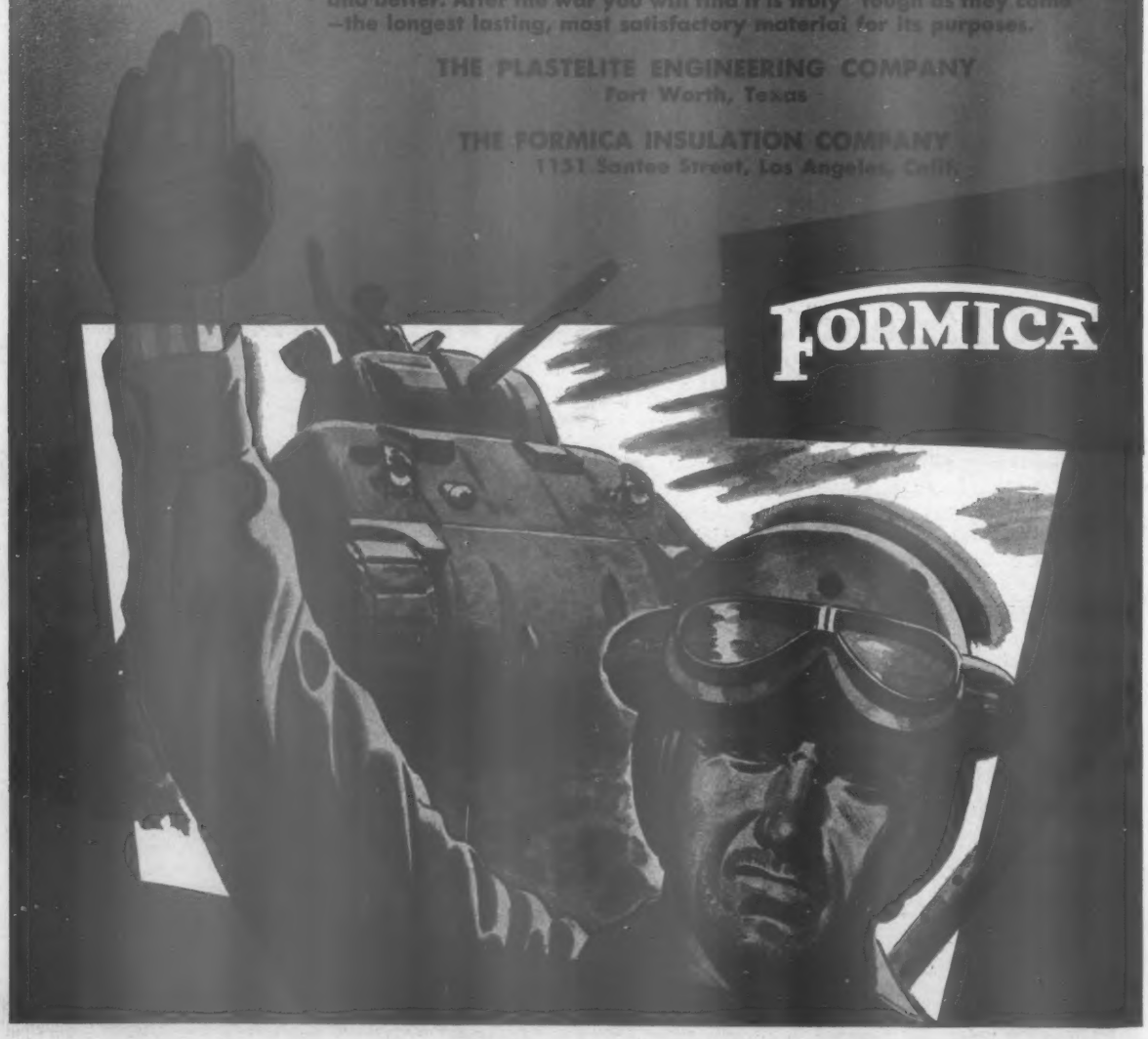
Due to Formica's lighter weight, immunity to petroleum and its distillates, parts of this modern plastic material last a long time, and greatly reduce the number of tear downs for maintenance.

Just now all of it is going into fighting machines, planes, tanks, trucks, jeeps and many others, and you may not be able to get it.

Meantime research, made necessary to meet war conditions, has been making it better and better. After the war you will find it is truly "tough as they come" —the longest lasting, most satisfactory material for its purposes.

THE PLASTELITE ENGINEERING COMPANY
Fort Worth, Texas

THE FORMICA INSULATION COMPANY
1151 Santee Street, Los Angeles, Calif.



AVOID this Costly Valve Leakage

AREA OF LEAK	AIR		STEAM		WATER	
Diameter Inches	Number of cubic feet per month at 75 lb. pressure	Total cost of waste per month 11c per 1000 cubic feet	Pounds wasted per month at 160 lb. pressure	Total cost of waste per month 65 per 1000 lb.	Gallons wasted per month at 60 lb. pressure	Total cost of waste per month 16c per 1000 gallons
1/2"	13,468,000	$1,481.44	1,219,280	$792.53	1,5[illegible],100	$243.86
3/8"	7,558,500	831.44	684,290	444.79	85[illegible],360	136.86
1/4"	3,366,990	370.37	304,820	198.13	3[illegible],020	60.96
1/8"	824,570	90.70	74,650	48.52	93,310	14.93
1/16"	213,000	23.43	19,280	12.53	24,110	3.86
1/32"	52,910	5.82	4,790	3.11	5,99[illegible]	.96

Enlarged copies of this chart available on request; also [illegible] for Lunkenheimer Catalog [illegible]

Valves aren't easy to replace these days . . . practically all materials going into their manufacture are on the critical list. This means that it is up to every valve user to take the best care of what he has, to insure the longest possible service life.

Leaky valves are saboteurs of your production schedules . . . obstructing your best efforts and increasing your costs. The chart illustrated above gives you an idea of what valve leakage costs you, not to mention the lowered efficiency of your operations.

Fortunately, valves respond to good treatment. Careful handling, immediate repair of the slightest leaks, and prompt replacement of worn parts will keep them on the job, ready to meet the demands imposed by industry's unprecedented war effort.

ESTABLISHED 1862

THE LUNKENHEIMER CO.

"QUALITY"

CINCINNATI, OHIO, U. S. A.

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BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S.P.; BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS

Telephone Systems Can Be Serious PRODUCTION BOTTLENECKS?

RIGHT! That's Why Your Telephone Facilities Should Be Checked Against Today's Needs

After doing so much in so short a time—expanding refining capacity to meet wartime needs, taking on synthetic rubber production, revolutionizing transportation methods—it would be nothing short of tragic to let inadequate communication facilities slow up operations. For unless telephone service at offices, plants, tank farms, or pipe lines measures up to present day standards, precious minutes and hours are being lost, manpower is being wasted, and output is sure to suffer.

To take stock of your present telephone system—to determine where and how service can be improved—is a simple matter that need not take time away from other pressing duties. Simply take advantage of the experience and ability of Kellogg Field Service Engineers. They are fully qualified to give expert advice on all communication problems.

Write today for full information to the Kellogg Industrial Service Department.

KELLOGG SWITCHBOARD & SUPPLY CO.
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SEE HOW KELLOGG CAN HELP YOU ON COMMUNICATION PROBLEMS

Kellogg Field Service Engineers
If your telephone facilities have not been re-engineered to meet wartime requirements, consult one of our experienced Field Service Engineers. He's qualified to help improve your facilities and service.

Kellogg PBX Systems
These modern systems greatly speed up inter-departmental communications — permit executives to hold telephone "conferences" at widely separated points and to reach all departments quickly.

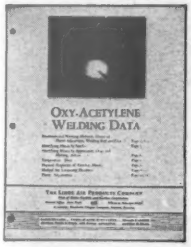
Kellogg Relaymatic Switchboards
Provide instantaneous 24-hour-a-day communication, without need of an attendant. Also used to spread instantaneous alarms (fire, accident, sabotage, etc.) by a single operation.

Kellogg Line Supply Service
A complete service on telephone line supplies that permits you to maintain facilities in excellent operating condition. Many shipping points, convenient to "everywhere."

KELLOGG WHERE ENGINEERING AND RESEARCH BUILD *Finer Communication Equipment* FOR WAR AND PEACE

HELPFUL LITERATURE
for Oxy-Acetylene Welding and Cutting Operators

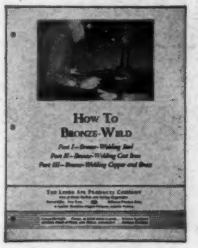
As part of our service to industry, the Linde organization makes available a library of oxy-acetylene process information. A partial list of this "how-to-do-it" literature is shown here. If you need copies of any of the booklets described, you can obtain them from any Linde office, without charge. Please ask for them by Form numbers.



OXY-ACETYLENE WELDING DATA

12 pages—Form 4600

Charts, tables, and recommended welding methods; choice of flame adjustments, welding rod, and flux; methods for identifying metals; physical properties of familiar metals; temperature data chart; and a conversion table for hardness numbers are included in this booklet.



HOW TO BRONZE-WELD

16 pages—Form 4328

This booklet discusses the theory and advantages of bronze-welding, and describes by means of step-by-step pictures correct techniques for bronze-welding steel, cast iron, copper and brass. Bronze-welding and bronze-surfacing techniques are also shown in pictures of practical applications.

INSTRUCTION OUTLINE FOR WELDING ALUMINUM

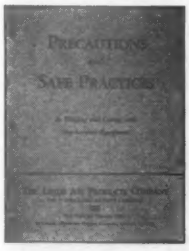
8 pages—Form 4538

Instructions for welding aluminum sheet and plate, including the choice of proper flame and rod, the joint design, the use of jigs and supports, and cleaning and fluxing, are given in step-by-step illustrations. How the physical characteristics of aluminum affect welding technique is also discussed.

INSTRUCTION OUTLINE FOR WELDING STEEL

20 pages—Form 4645

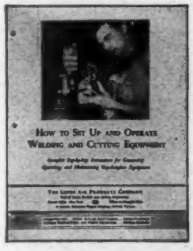
This is a series of practice exercises ranging from primary melting to making position butt welds in steel sheet and plate. Instructions for blowpipe manipulation and rod deposit, and examples of both good and poor welds, are included for guidance in correcting faulty procedure.



PRECAUTIONS AND SAFE PRACTICES

56 pages—Form 2035

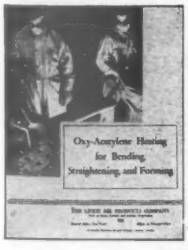
A copy of this booklet should be in the hands of every operator of oxy-acetylene welding and cutting equipment. It completely covers all the safety precautions that should be observed in setting up and operating equipment, in handling calcium carbide and oxygen and acetylene cylinders, and in maintaining equipment.



HOW TO SET UP AND OPERATE WELDING AND CUTTING EQUIPMENT

20 pages—Form 5165

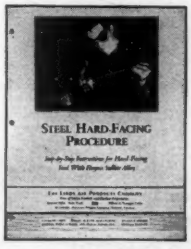
Complete, step-by-step illustrated instructions for connecting, operating, and maintaining oxy-acetylene welding and cutting equipment. A careful study of the various suggestions in this booklet will aid all operators in getting the most out of their equipment, and will help to promote safety.



OXY-ACETYLENE HEATING FOR BENDING, STRAIGHTENING, AND FORMING

8 pages—Form 4200

The many applications of the oxy-acetylene flame for "smithing" operations, its use in automotive production and repair, in the boiler shop, and for upsetting and stretching, are reviewed. Three methods for straightening bent shafts are given.



STEEL HARD-FACING PROCEDURE

8 pages—Form 3491

The special instructions given here, based on the general hard-facing procedures, should prove helpful to everyone applying Haynes Stellite alloy to steel surfaces. A chart of hard-facing materials data and a listing of suggested hard-facing applications are also included.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 E. 42nd St., New York, N. Y. UCC Offices in Principal Cities

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The words "Haynes Stellite," "Oxweld," "Linde," "Prest-O-Lite," "Union," "Prest-O-Weld," and "Purox" are trade-marks

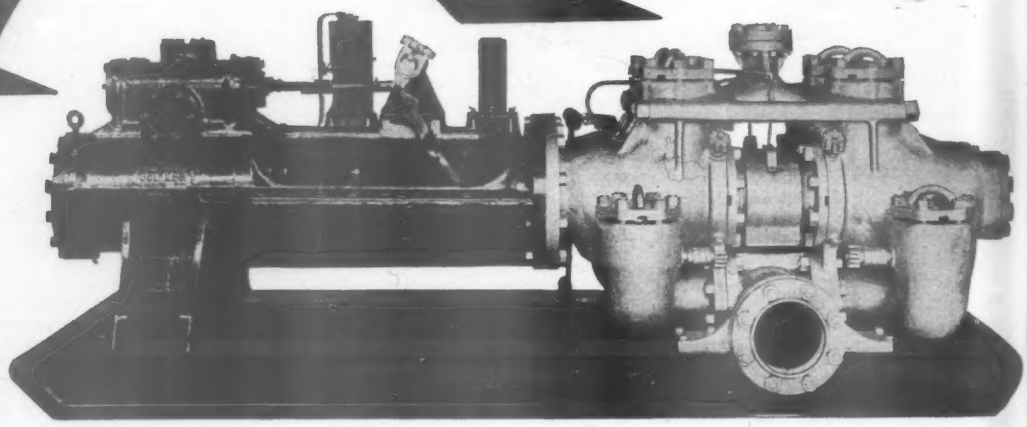
LINDE OXYGEN . . . PREST-O-LITE ACETYLENE . . . UNION CARBIDE
OXWELD, PUROX, PREST-O-WELD APPARATUS . . . OXWELD SUPPLIES

OLDTIMERS IN THE OIL COUNTRY KNO

NEW MEMBERS OF T

ABERCROMBIE
SHEAR-RELIEF
VALVE

ABERCROMBIE
FLUID-PISTON
SLUSH-PUMP



THE ABERCROMBIE SHEAR-RELIEF VALVE protects pumps, manifolds, drilling hose, etc., against excessive pressure. A common nail shears when pump pressure against the valve piston reaches the shear stress of the nail, releasing the flow of fluid through the valve outlet. The sheared nail is the only damaged part, and the valve is easily reset with another nail by any member of the crew . . . using directions on the valve nameplate for nail sizes and the pressures at which each size shears.

OUTSTANDING FEATURES OF THE FLUID-PISTON SLUSH PUMP

1. No moving parts in contact with mud.
2. Plungers and rods packed against clear water only.
3. No liners or pistons used.
4. Reduced friction of reciprocating parts.
5. Maintained discharge capacity—no slippage past FLUID-PISTON.
6. Unobstructed, oversize seat openings.
7. Valve seats easily removable by hand—no seat puller required.
8. One-piece valve with renewable rubber insert in seat.
9. Large, streamlined fluid passages thruout.
10. Cast steel construction thruout.
11. Oversize suction strainer, easily removable, in suction manifold.
12. Available for connection to existing steam or power ends, as well as complete steam pumps.

J. E.

NOW YOU MAY CAMERON-IZE FOR S

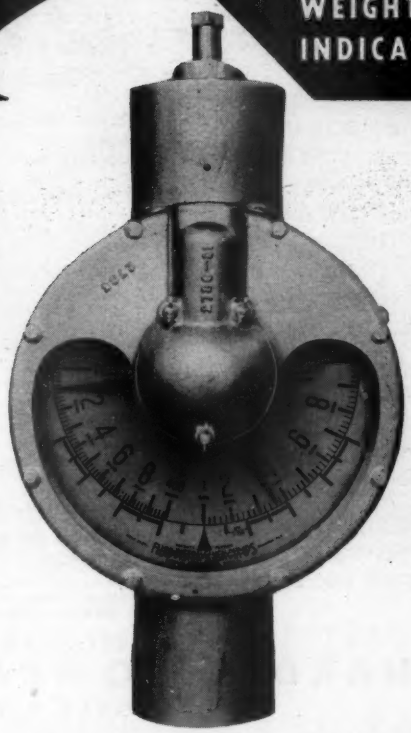
THE CAMERON FAMILY

ALL EQUIPMENT FORMERLY MANUFACTURED BY [illegible] PUMP CO. IS NOW BEING MANUFACTURED, SOLD AND SERVICED BY CAMERON IRON WORKS, INC.

ABERCROMBIE PRESSURE GAUGE

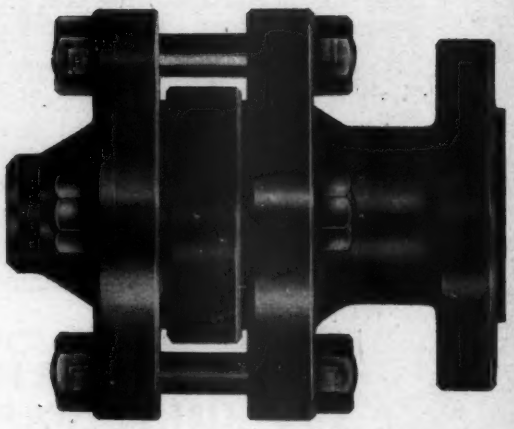
THE ABERCROMBIE PRESSURE GAUGE tells you in sign-board figures the exact pressure at all times on your mud, water, oil, gas, or any liquid line. The gauge is not affected by external vibrations, and pump pulsations are dampened over the entire pressure range without adjustments, therefore excessive movement of the dial is minimized, and a steady reading is easy at a glance from 30 feet away. It employs no Bourdon tube and screws directly on the line. The self-contained diaphragm prevents line fluid from entering any part of the gauge mechanism. Its rugged design and construction has definitely taken pressure measurement out of the delicate instrument class.

ABERCROMBIE WEIGHT INDICATOR



THE ABERCROMBIE WEIGHT INDICATOR is a universal-service, self-contained unit that reads the load directly in pounds. It is completely mechanical in design and, hence, is free from troubles due to leakage of high pressure fluids, or due to temperature changes. The experience-proven movement of the Abercrombie pressure gauge is employed. The oil-filled case provides a viscous damping of the dial to eliminate the effects of mechanical vibration. In addition to damping the movement, the oil prevents the unbreakable glass face from clouding with moisture condensate. The unit is trouble-free and dependable. The steel linkage system is equipped with roller bearings. The calibration of the instrument cannot change due to wear on the system as the cable is clamped lightly at one point and rides on rollers at two other points.

ABERCROMBIE Type "C" WAFER CHECK-VALVE



THE ABERCROMBIE WAFER CHECK VALVE, for gas, air, or steam, fills an important place in high pressure cycling and pressure maintenance plant lines where violent pressure fluctuations occur . . . where a check valve with extremely light moving parts is necessary. This valve positively will not pound itself out on a single machine, or on single-acting cylinder installations. It is built to 8,000- or 10,000-pound test and employs API Series 1500 or Series 2500 flanges of the ring joint type.

CAMERON IRON WORKS, INC.

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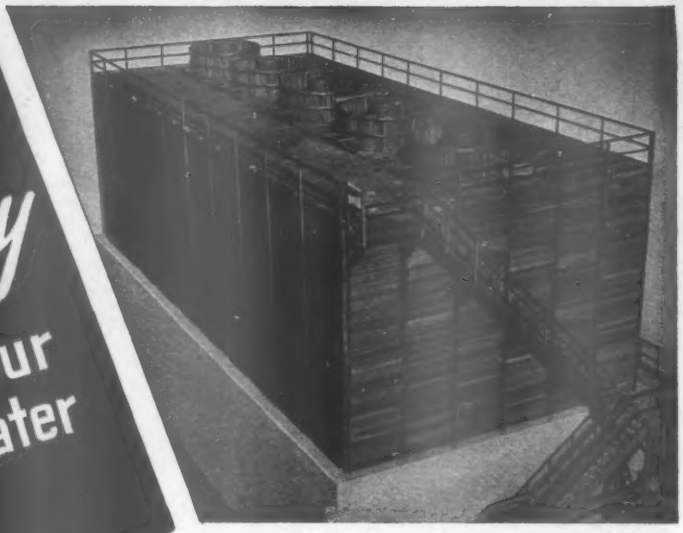
STILL GREATER EFFICIENCY AND SAFETY!

How to Save a Lot of Money

By CAPITALIZING Your Mechanical Draft Water Cooling Costs



A mechanical draft cooling tower is, in most cases, a means of saving money. The cost of that tower, erected and ready for service, plus the cost per year to operate it, are therefore completely tied up together. To know just where you will stand in five years, both first cost and operating cost should be figured *when the tower is bought.* That is cost capitalization.

Pritchard mechanical draft towers almost invariably show a saving when competition is on this basis. The reasons why are discussed in the column at the right. This saving usually is substantial enough to make any reasonable first cost acceptable.

That is why it will pay you to get cost capitalization figures from Pritchard—and from all other bidders—before you buy any mechanical draft cooling tower. Write today.

THESE IMPORTANT FACTORS Reduce Pritchard Mechanical Draft Operating Costs

1. High Efficiency, Light Weight, Non-Corrosive Monel Fans. Pritchard fans are the heart of Pritchard tower efficiency and economy. Their superior design and construction saves tremendous amounts of horse power over a period of years. Blades have a special twist and taper that gives a steady, uniform air flow through the entire fan opening.

The use of non-corrosive sheet monel over a light, strong framework cuts weight to half that of cast alloy — ends corrosion and pitting troubles. Larger blades, and often fewer of them, move the required volume of air with less fan speed and less fan power. Pritchard fan drive design and fan housing design, particularly in induced draft towers, contribute further to fan efficiency and horsepower economy.

2. Low Pumping Head. Closed pipe water distribution through gravity sprinklers cuts down frictional resistance; saves pump power for lifting; sometimes even permits building higher towers without waste.

3. Liberal Size and Rating. Any "skimping" on capacity must be made up by an extra load on fans or tower efficiency will suffer. Pritchard towers are sized and rated to permit low air velocities and consequent lighter fan loads.

Further details on request. Write for them.

J. F. PRITCHARD & COMPANY
FIDELITY BUILDING KANSAS CITY, MO.

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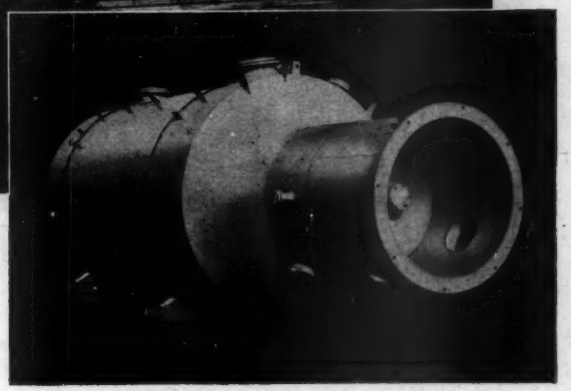
Atmospheric and Mechanical Draft

WATER COOLING TOWERS

ALCO

PRESSURE VESSELS • FABRICATED STEEL PLATE



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MANUFACTURING FACILITIES INCLUDING STRESS RELIEVING AND RADIOGRAPHING ARE AVAILABLE FOR WAR PROJECTS

AMERICAN LOCOMOTIVE COMPANY
ALCO PRODUCTS DIVISION
30 CHURCH ST., NEW YORK, N. Y. DUNKIRK, N. Y.

New ELECTRONIC POTENTIOMETER

Eliminates Manual Balancing

NO longer is it necessary to manually balance an Indicating Potentiometer to obtain temperature readings.

The new Brown Electronic "Self-balancing" Precision Indicator reads the correct temperature instantly when the operator throws the proper key switch.

This new instrument utilizes the standard "Continuous Balance" electronic principle incorporated in the well-known Brown Circular Chart Air-O-Line Potentiometer Controller. It uses no conventional galvanometer and is not affected by vibration.

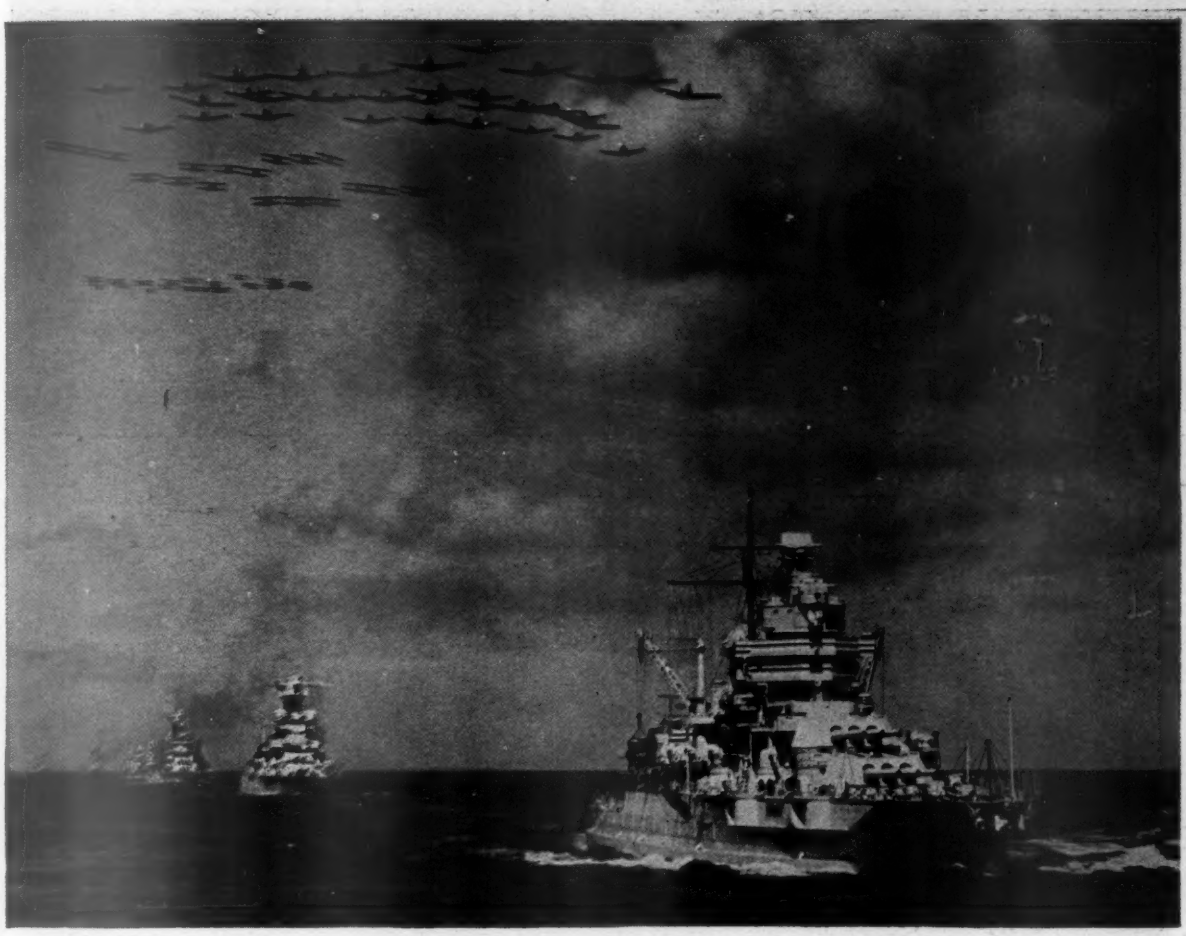
Precision readings are made possible by the use of a rotating scale, over 28″ in length, graduated to permit readings to within one part in 2400. This scale is power driven and can travel through full range in less than 10 seconds. There is no waiting for a galvanometer to balance—the instrument balances quickly without cycling.

The Brown Precision Indicator can be used with any number of separately mounted key switches, in exactly the same manner now employed in manually balanced instruments. Integrally mounted push button switches will also be available in limited quantities.

WRITE THE BROWN INSTRUMENT COMPANY, 4488 Wayne Avenue, Philadelphia, Pennsylvania, a division of Minneapolis-Honeywell Regulator Company, Minneapolis, Minnesota. Offices in all principal cities. 119 Peter Street, Toronto, Canada—Wadsworth Road, Perivale, Middlesex, England—Nybrokajen 7, Stockholm, Sweden.

Instruments by **BROWN** *and Controls by*

MINNEAPOLIS-HONEYWELL



ON GUARD

• • • The umbrella of air power over the surface units of the fleet provides effective protection against surprise attack from the skies or from under the surface of the water.

KELLOGG-built plants are now producing aviation gasoline enabling our planes to fly faster and further than those of the Axis.

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CATALYTIC PROCESSES for Cracking, Hydroforming, Reforming, Dehydrogenation, Alkylation, Desulphurization
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JUIK Processes . . . for Lubricating Oil Refining with Propane and Phenol • Deasphalting • Dewaxing • Solvent Extraction and Acid Treating Plants

NICKEL AIDS THE AERONAUTICAL INDUSTRY

to KEEP 'EM FLYING!

The design engineers of the aeronautical industry have repeatedly met demands for improved aircraft to serve on world-wide fighting fronts. At the same time the industry has been able to turn out huge quantities of highly complex precision mechanisms on a mass-production basis.

Since the pioneer days of the aviation industry, it has made extensive use of materials containing Nickel for engine and fuselage parts. In these applications the industry's engineers have developed to the fullest extent the useful and unique properties contributed by Nickel to the materials commonly used in aircraft construction.

The continued widespread use of Nickel reflects confidence based on innumerable satisfactory performance records.

On all fronts, pilots and maintenance crews are learning what metallurgists long have known. Properly used, a little Nickel goes a long way toward assuring the dependable performance of aircraft. From valves to drive gears, and from crankshafts to manifolds, modern aircraft perform more dependably because of the added strength, toughness and resistance to corrosion Nickel imparts to other metals.

The technical staff of International Nickel has been privileged to cooperate with the aeronautical engineers who have accomplished so much toward the improvement of aircraft. These engineers and metallurgists offer counsel and data to all who desire assistance in the selection, fabrication and heat treatment of ferrous and non-ferrous metals.

★ Nickel ★

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THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York, N.Y.*

Crude oil goes to war

Today the available supply of crude oil is limited and so is the market for peacetime products

But the demand for war products that can be made from that crude oil is unlimited

Uncle Sam is the preferred customer He needs 100-octane gasoline, synthetic rubber and toluene in enormous volume

Don't you think refiners who can make those products—or their components—efficiently will have first call on crude if there isn't enough to go round?

It's wise and it's patriotic to get into war production as soon as you can

And it's wise to call on Universal refining specialists to help you They are helping to convert peacetime units to wartime operation right along

All Universal processes, as well as Universal experience and know how are at your service—at the service of every refiner

Call on U. O. P.

OIL IS AMMUNITION—USE IT WISELY CARE FOR YOUR CAR FOR YOUR COUNTRY

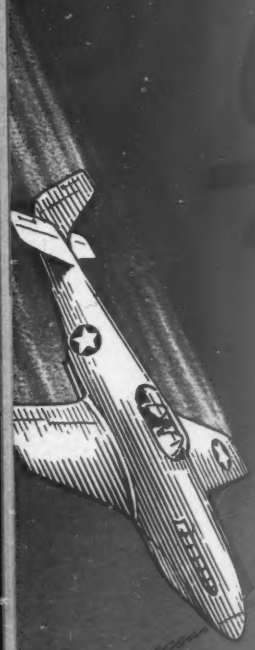
Universal Oil Products Co
Chicago, Illinois

Dubbs Cracking Process
Owner and Licensor

THE REFINERS INSTITUTE OF PETROLEUM TECHNOLOGY

PULL OUT OF IT, SKIPPER..

Get control!



....plummeting toward destruction at screaming speed! Only two things matter—positive control! Instant response!

In the air . . . lives are at stake! In industry . . . vital synthesis depends also on positive control . . . on instant response! That's why G-MV compressors are winning the synthesis battle in critical plants everywhere!

Cooper-Bessemer's unique, automatic control is exceptionally effective in maintaining accurate pressure, flow-rate, torque, and time cycle functions over a 100% demand variation—exceptionally effective because the control was developed with an intimate knowledge of processing requirements . . . and because Cooper-Bessemer engineering advancements give the G-MV the reliability . . . the flexibility . . . and the precise response so essential to perfect control.

No wonder the Type G-MV is industry's outstanding compressor. It is built in four sizes—400, 600, 800, and 1000 hp—with a wide range of compressor cylinders for any gas and for extremely high pressures. C-B engineers, experienced in process problems, can help you "get control". They're at your service.

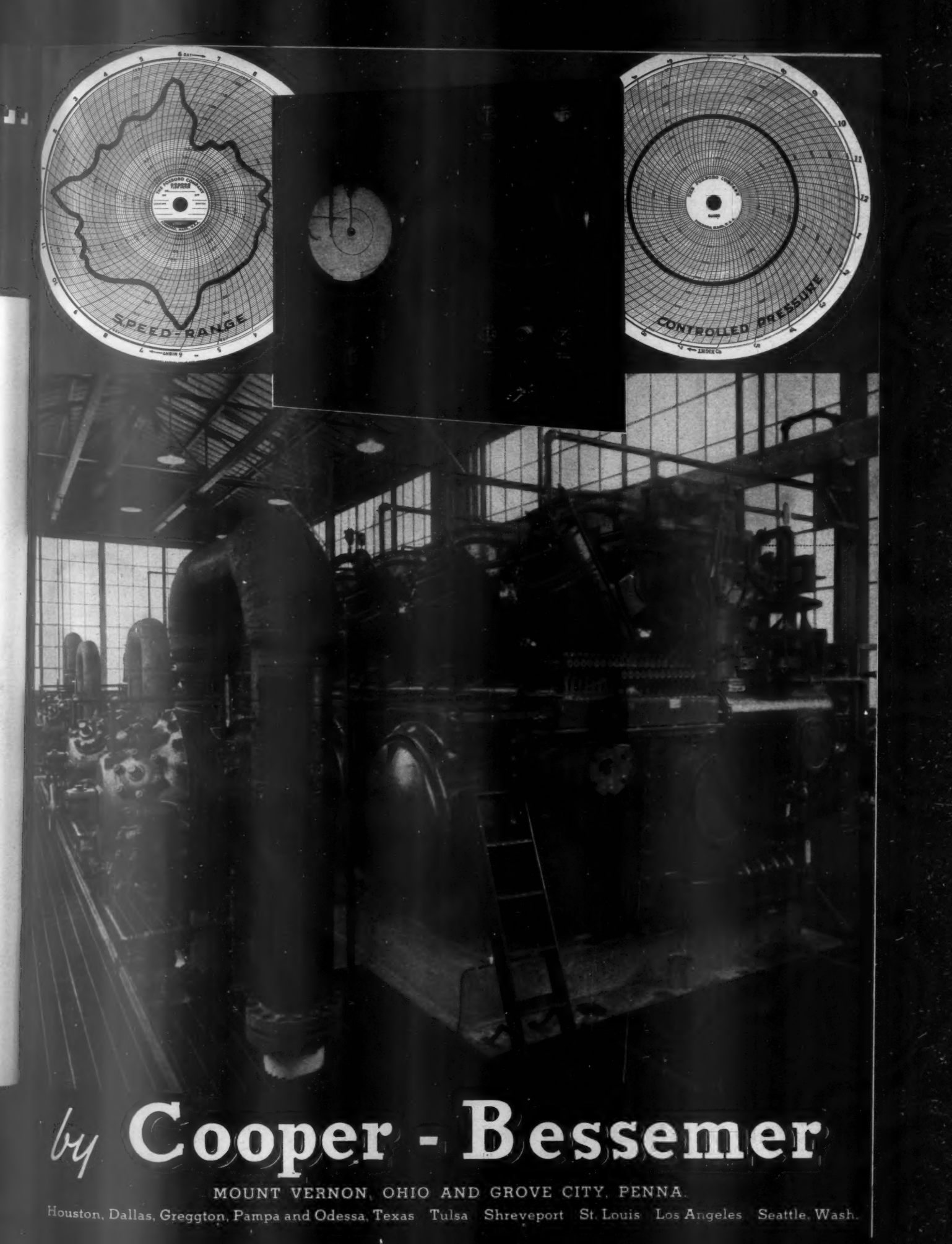
Synthetic Rubber
Synthetic Ammonia
Helium

Gas Reforming
Natural Gasoline Cycling
Refining

Natural Gas Transmission
Compressing Air and Gases for other Vital War Industries

TYPE G-MV ANGLE Compressor

New York Washington Bradford, Pa. Parkersburg, W. Va. Gloucester, Mass.



by **Cooper - Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

Houston, Dallas, Greggton, Pampa and Odessa, Texas Tulsa Shreveport St. Louis Los Angeles Seattle, Wash.

WHAT *you say – when you say*

PORUS ★ KROME

You say—

"Less wear on cylinders."

"Less wear on piston rings."

"Level oil consumption."

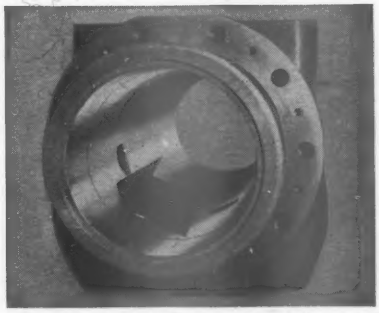
What you've said is—

"Longer engine life and more efficient performance."

That's what you get with PORUS-KROME.

PORUS-KROME is a precision process of applying hard chromium, of controlled porosity and smoothness, to cylinder bores of internal combustion engines.

Europe knows it well, uses it widely. That is where this process originated . . . in Holland. England and Canada know and use it, too. And America is learning fast. PORUS-KROME is a going operation here, now, for military purposes.



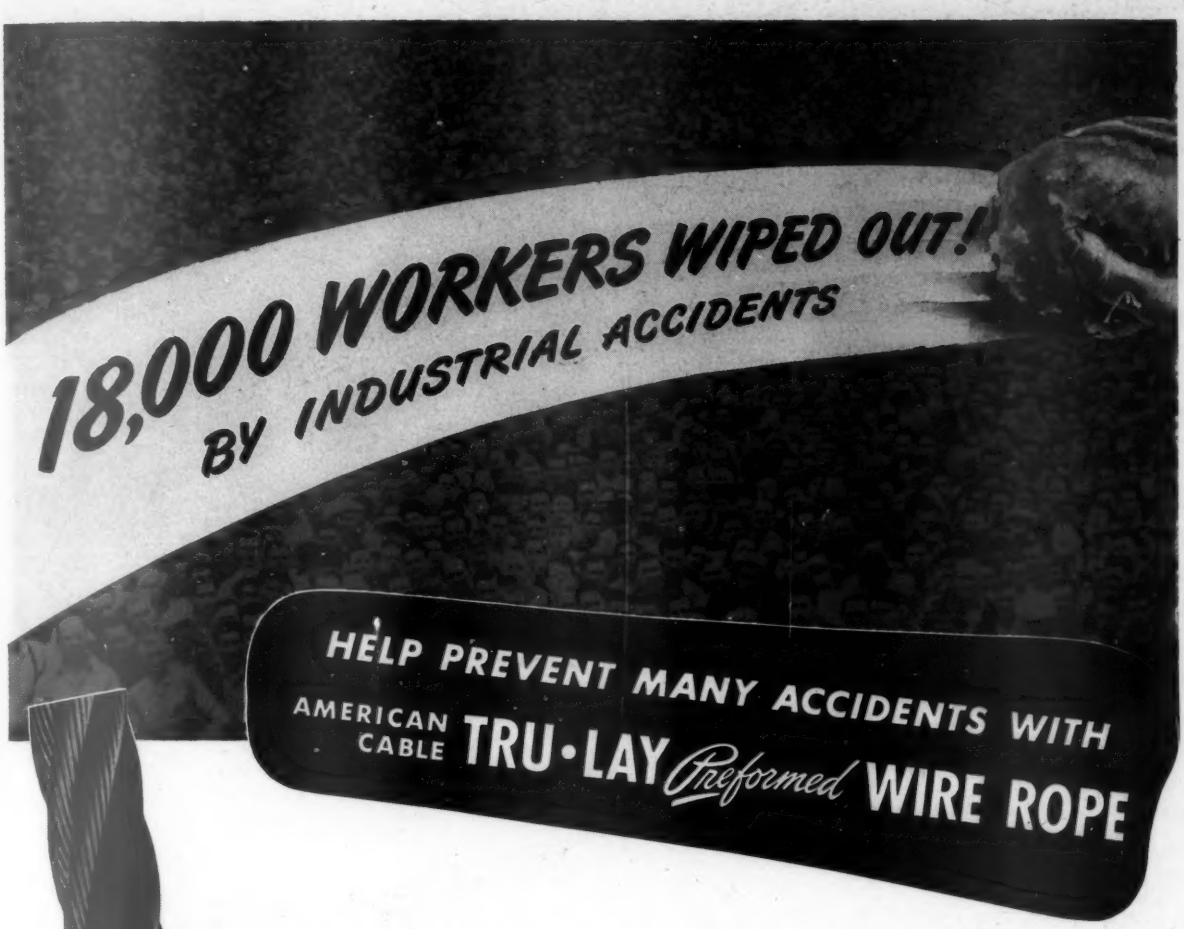
PORUS-KROME is the precision application of hard chromium, having controlled porosity and smoothness, to internal combustion engine cylinder bores, and other bearing surfaces. The improved lubrication plus low friction adds greatly to both life and efficiency by decreasing wear and corrosion.

VAN DER HORST

PORUS ★ KROME

Multiplies Engine Life

VAN DER HORST CORPORATION OF AMERICA CLEVELAND, O. OLEAN, N. Y.


18,000 WORKERS WIPED OUT!
BY INDUSTRIAL ACCIDENTS
HELP PREVENT MANY ACCIDENTS WITH
AMERICAN CABLE TRU-LAY Preformed WIRE ROPE

You would be horrified at newspaper headlines which said the enemy had wiped out an entire division of the U. S. Army! Yet, in 12 months after Pearl Harbor, an entire division of industrial workers were killed by accidents—*many of them needlessly.*

Many operators have drastically reduced time-out accidents (and compensation claims) by adopting American Cable TRU-LAY Preformed—the safer wire rope. Being preformed, American Cable TRU-LAY is flexible—much easier to handle. It resists kinking and snarling. Worn and broken crown wires lie flat and in place, refusing to wicker out to puncture hands and possibly cause blood poisoning. Furthermore, being preformed, TRU-LAY will last longer than ordinary wire rope. It has far greater resistance to bending fatigue and that means reduced machine shutdowns for replacement—steadier production—greater dollar value. Do everything possible to reduce time-out accidents—everything possible to maintain high production. All American Cable Ropes made of Improved Plow Steel are identified by the Emerald Strand.

AMERICAN CABLE DIVISION

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, San Francisco, Emlenton, Pa.
Distributors in all important oil field centers

AMERICAN CHAIN & CABLE COMPANY, INC.

BRIDGEPORT, CONNECTICUT

ESSENTIAL PRODUCTS . . . TRU-LAY Aircraft, Automotive, and Industrial Controls, TRU-LOC Aircraft Terminals, AMERICAN CABLE Wire Rope, TRU-STOP Brakes, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Castings, CAMPBELL Cutting Machines, FORD Hoists, Trolleys, HAZARD Wire Rope, Yacht Rigging, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*

"... HEROISM ABOVE AND BEYOND THE CALL OF DUTY"

Merchant Marine Distinguished Service Medal—
U. S. Maritime Commission

Below: Ribbon which may be worn
in lieu of the Medal

... Merchant Marine Distinguished Service Medal ... for heroism above and beyond the call of duty during enemy attack when (this Quartermaster) released and launched a life-raft from a sinking and burning ship and maneuvered it through a pool of burning oil to clear water by swimnning under water, coming up only to breathe. Although he had incurred severe burns about the face and arms ... guided four of his shipmates to the raft, swam to and rescued two others. His extraordinary courage and disregard of his own safety ... will be an enduring inspiration to seamen of the United States Merchant Marine everywhere."

On April 11, 1942, the Congress of the United States approved a Joint Resolution "... that the United States Maritime Commission is hereby authorized and directed, under such rules and regulations as it may prescribe, to provide and award a medal ... to each person who, in the American Merchant Marine, on or after September 3, 1939, has distinguished himself ... by outstanding conduct or service in the line of duty ..."

HUGHES TOOL COMPANY—Houston, Texas